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Parts of Sound-Picture Film Printing Machine Made to Close Limits

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SPROCKET gear hobbing to limits as close as 0.0002 in. has become a necessity since the application of the sound track to motion picture film. Whence comes the demand for such refinement in manufacturing? Where does the machine tool industry play its part? And, how are such limits maintained in production work?

It requires no stretch of imagination when considering the motion picture industry to understand that in the last analysis the movie theater audience is the final judge. If it was exacting in demanding quality in silent films, it is even more critical in appraising sound films, the production of which has added many new complications.

Sounds of low frequency give little trouble, but when frequencies of 4000 to 5000 per sec. (the upper range of the piano) are encountered the time element becomes so important that extreme machine accuracy is a necessity. In order to open the sound track for greater clarity the industry speeded up the pictures from 16 per sec. to 24 per sec.

Film made by the camera and sound-recording unit is a negative and from it must be printed positive films which are projected on the theater screen. Assuming the negative to have been of the first order, there still remains the problem of accuracy in printing.

The Bell & Howell Co., Chicago, was quick to appreciate the necessity for accuracy. Among the important steps it took was to strive for extreme precision in its printing ma-

APPLICATION of the sound track to motion picture film has necessitated extreme accuracy in the machines that print the positive films which are projected on to the theater screen. The accuracy to which the strategic parts of such machines are made is shown in this outline of the manufacture of the sprocket assembly that drives and guides the film during the printing process.

chine. One of the points of attack was the aperture sprocket, the teeth of which engage in the film perforations at the time and place that the printing is being done. This part is made from a steel forging 5¾ in. long by 4½ in. in diameter at the largest dimension.

Problem Turned Over to Engineering and Research Department

The problem was not one of merely deciding what results were wanted and turning the job over to the shop. It was necessary to set in motion the engineering and research department, which, among other steps, arranged with the Barber-Colman Co., Rockford, Ill., to supply a gear hobber that would work to the limits required.

The engineering department of the Bell & Howell Co. is housed in a separate building near the Chicago River, about a mile away from the production plant and in a neighborhood where there is no disturbance to

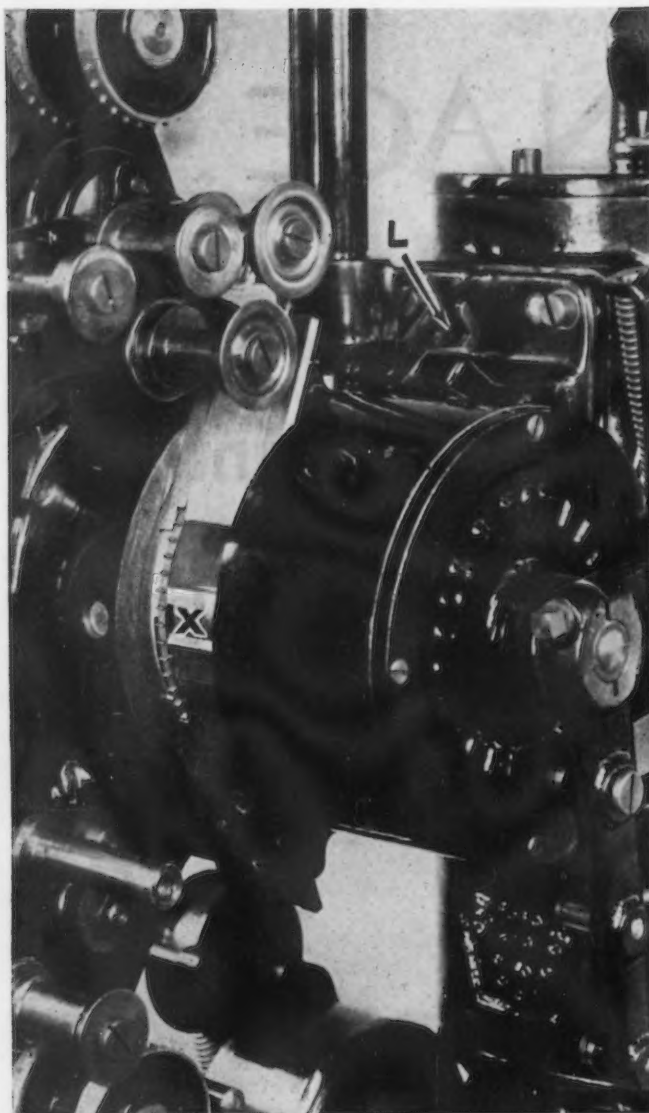
the work being done. It is prepared to do research, draw plans, make drawings and shop schedules, build models, make all necessary jigs, fixtures and gages, manufacture parts to try the jigs and fixtures, heat treat, inspect and even manufacture on a limited scale when parts are few and require extreme accuracy of manufacture and inspection. When this department is ready with a new product, every preliminary step has been taken and everything is in readiness for the production department to take up the work.

The aperture sprocket part consists of two sprockets, one integral with its shaft and the other made from a separate piece of steel and mounted on a flange at the end of the shaft. This separate sprocket is secured to and over the flange by four machine screws and is located by a dowel pin.

Sprocket Operations Start with Inspection of Forging

Operations on the aperture sprocket, control side, start with inspection of the forging. The piece is then chucked on the outside diameter in a chucking machine and rough-faced and center-drilled, and then re-chucked on the 0.625-in. diameter and end-faced and center-drilled. It is then supported with center in turret and rough-turned on four diameters and rough-faced on two diameters. An engine lathe operation calls for finish turning, after which there is a bench inspection of the turning and facing operations.

The diameter of the sprocket at this point is 3.925 in. + 0.002 in. and



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SHOE removed from aperture sprocket, which is in its mounting in the continuous contact film printer. The printing aperture is shown at X.

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operation with nut arbor results in finish-turning, after which a close bench inspection is made. Drilling, tapping, reaming and removing burrs finishes the part for final inspection before being mounted on the shaft with the other sprocket. The center hole has now been reamed to 0.625 in., + 0.0005 in., and the disk has been bored to 2.000 in., + 0.0005 in., to fit over the flange that was turned to 2.000 in., — 0.0005 in.

The two sprockets are carefully assembled and inspected for finish-facing flanges, turning all diameters, grooving and breaking the edges.

All the above operations are performed in the main production shop. Hobbing, because of the accuracy required, is performed in the engineering department where the special one-purpose hobbing machine has been set up.

This unit is equipped with a single-thread index worm and the backing plate is fastened solidly to the spindle. The shaft of the sprocket is hand-polished and is pressed into the spindle hole by hand. A backing-up collar is fitted between the two sprocket disks, and three set screws operating against plugs in the hub



the tooth face is 0.120 in. + 0.002 in. The flange diameter is 2 in., — 0.0005 in. The final machine operation calls for drilling and reaming the dowel pin hole and drilling and tapping for the machine screws. A final inspection checks reaming and tapping operations.

The sprocket which is mounted on the flange of the above piece is cut from a 4-in. steel bar. It is turned to the same diameter as its companion piece, but the width of the sprocket tooth face is left only 0.088 in., ± 0.002 in. This sprocket acts only as a drive, its mate having teeth the width of the perforations in the film, and thereby serves to keep the film from moving to either side.

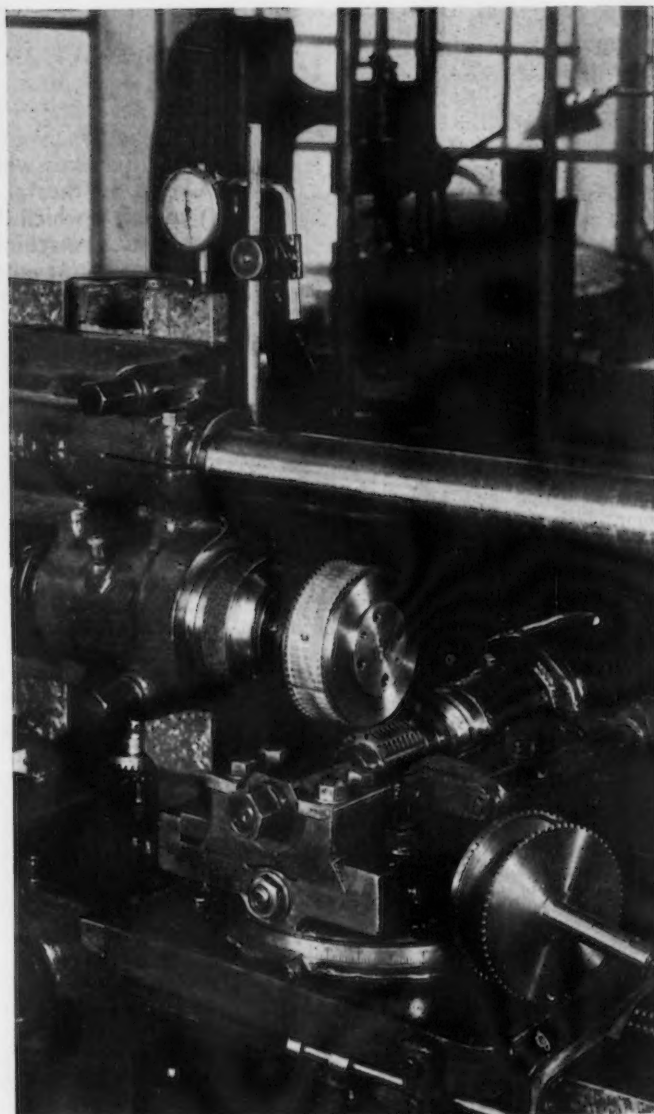
Operations on Driving Sprocket

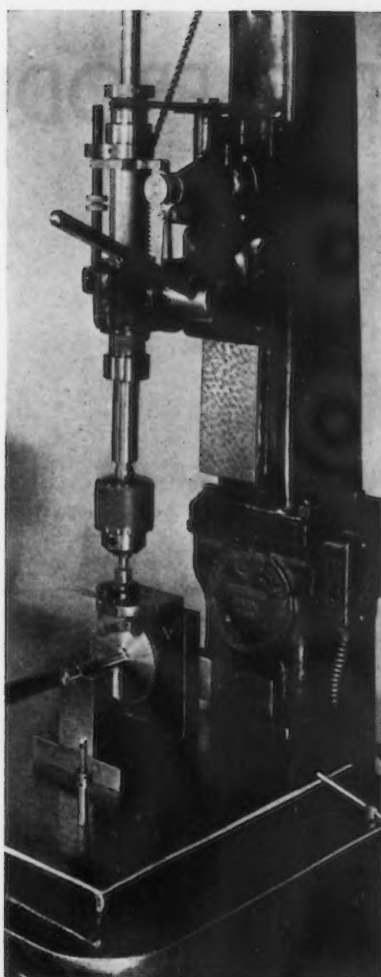
The first operations consist of material inspection and then cutting a 4-in. bar to 9/16 in. lengths. A part is chucked in a screw machine, rough-faced, rough-turned, and a 19/32-in. hole is drilled through the center. It is then chucked in an engine lathe, finish-faced, finish-bored and reamed, following this the piece is clamped to a faceplate and finished faced in an engine lathe. Another engine lathe



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THE special hobber is equipped with single-thread index worm. The backing plate is fastened solidly to the spindle, and a backing-up collar is fitted between the sprocket disks.

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SPECIAL fixture holds part when forming radii on ends of sprocket teeth. An automatic attachment feeds the cutter in and out.
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SPACING of sprocket teeth is closely checked. This dividing head is calibrated with divisions of 0 deg., 0 min., 15 sec., which is equivalent to 0.00014 in. on circumference of a 4-in. circle.
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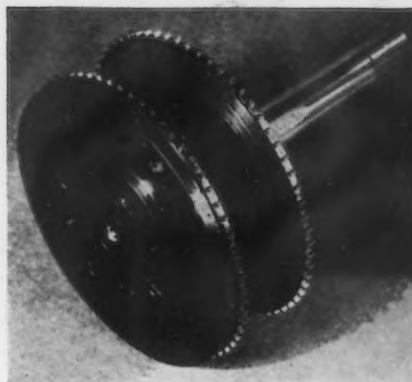
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TEETH on this assembled sprocket unit are hobbled on a machine designed to work to the close limits required.
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of the backing plate serve to hold the sprocket against slipping in the hollow spindle. The teeth are then hob-generated.

After hobbing, the sprocket is sent to the inspection room where Carl Zeiss equipment is used; on the diameter of less than 4 in. this equipment will show an error of 0.0002 in. in an arc of 15 sec. There are 64 teeth on the sprocket and before burrs are removed or the teeth hollow-milled the error in measurement between any two teeth must not exceed 0.0002 in.

Hollow-milling the control teeth to a radius of 0.0540 in. and width to 0.1090 in., —0.0005, is performed in a drill press, the sprocket being first clamped in a special fixture. An

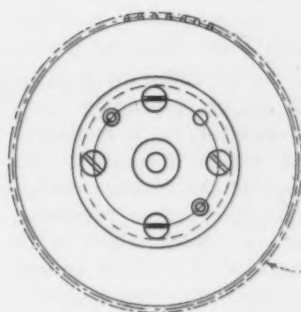
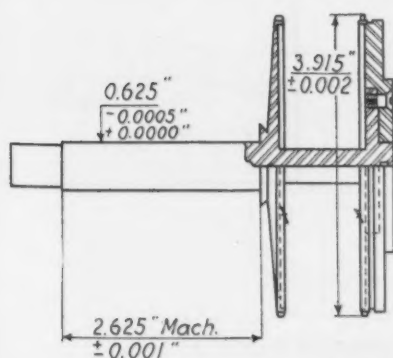


eccentric bushing locks the sprocket in the fixture in such a position that lugs fit down over two teeth leaving one tooth free between them. The hollow mill works up and down automatically over this free tooth to a

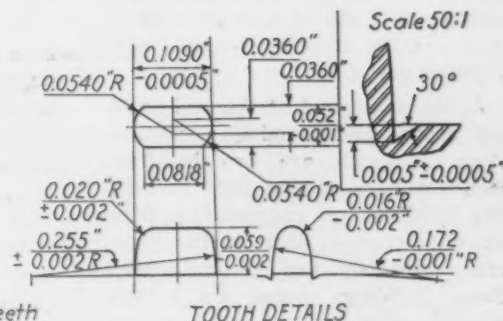
hardened gage point opposite the tooth being hollow-milled.

A few additional features in this engineering department are of interest. Foremen are stationed on raised platforms that overlook the operating floors. The foremen estimate the time for a job and then follow the time as the job progresses. The use of labor hours in this plant is important, not alone as a whole for a given piece, and operation by operation, but also as a check to catch delays that occur during the period of a single operation.

A battery of presses is set up on which to try dies before sending the dies to the production department. When a die is accepted, a part made by it is taken as a sample and is labeled and hung on a sample board in the engineering department.



64 Teeth



TOOTH DETAILS

Assembly sketch of aperture sprocket and some of the tooth details.

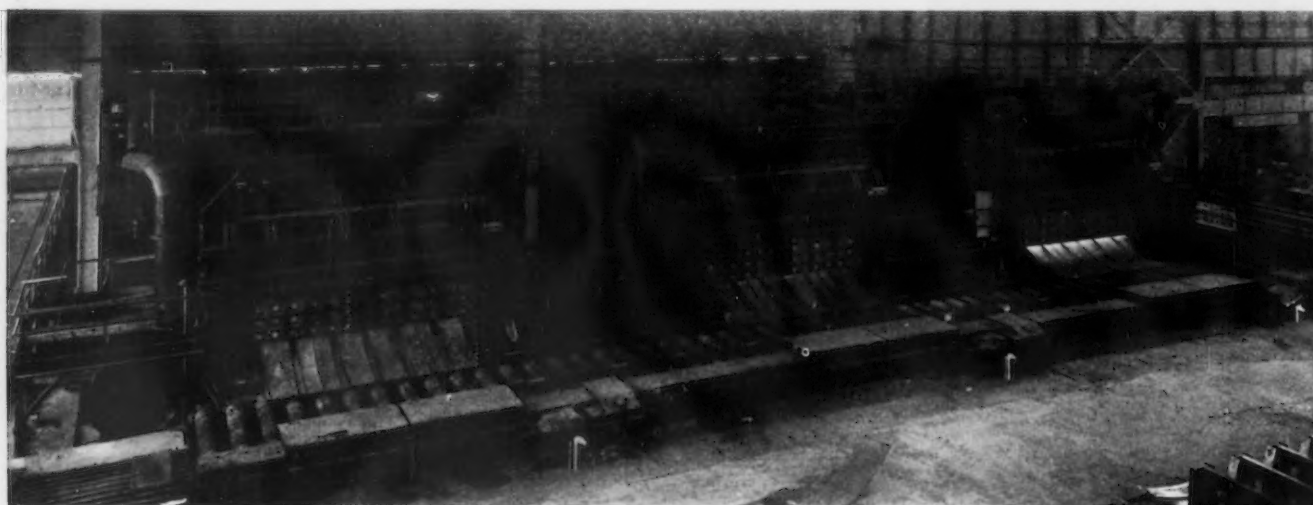
CONTINUOUS SHEET STRIP PRODUC T

By ROGERS A. FISKE
Western Editor, The Iron Age

THE mill and its accessories are housed in a group of buildings covering an area of about 340,000 sq. ft. The mill building proper is 105 ft. wide and 600 ft. long and is served by two 60-ton cranes. Parallel to the mill building is the motor room and the reheating furnace building with a combined length of 600 ft. and an approximate width of 60 ft. The motor room is served by a 50-ton

mill building construction. A brick wall approximately 14 ft. high insures warmth and cleanliness. Above the brick wall the siding consists of steel windows and corrugated metal. The roof of all buildings is of corrugated sheet steel with the exception of the motor room, furnace building and the slab yard, which are covered with concrete tile and built up roofing. The inside of the motor room

charge a slab having a maximum length of 15 ft. or acting separately two lines of shorter slabs can be charged. The furnaces are of the three-zone, triple-fired type using oil as a fuel. Furnace roofs are of the suspended arch design, and the furnaces are provided with refractory tile type recuperators. The discharge end of the furnace projects into the mill building and the skid



SPECIALY designed skid plates for discharging slabs without undue shock to the table are a feature of the reheating furnaces.

crane for repair purposes. Alongside of the motor room and furnace building is a closed slab yard 85 ft. wide and 360 ft. long equipped with a 25-ton crane.

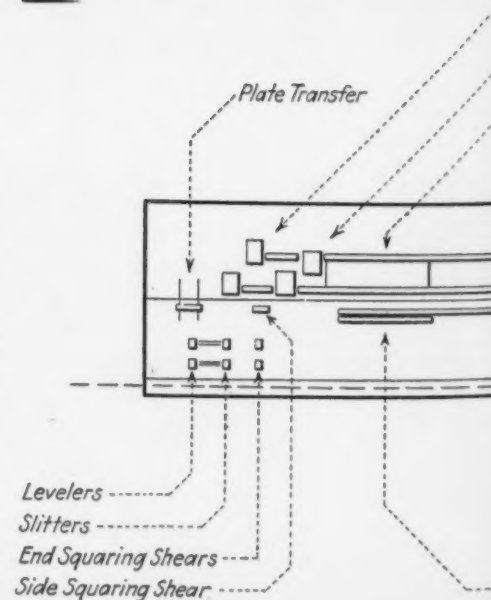
At the south end of the mill building proper and forming a continuation therewith are two buildings each 105 ft. wide and 1000 ft. long. The buildings are connected, to form an unobstructed floor surface, and are served by five 15-ton cranes. These buildings house the hotbed, runout tables, coilers, flying shears, pilers, plate transfer, plate shearing equipment and the shipping department.

All buildings are of modern steel

is completely lined with salt glazed brick and tastefully decorated.

To the west of this group of buildings and separated by a 75-ft. thoroughfare are the cold mills, pickling, annealing and sheet finishing group.

Slabs are placed either by a magnet or sling chains, depending upon the size and number, on a magazine slab charger which discharges one slab at a time on the furnace charging table. Each of three reheating furnaces have an inside width of 18 ft. and a length of 77 ft. from charging door to brow. The charging end of the furnace projects into the slab yard. Each furnace is provided with twin pushers which together can



UC TION AT INDIANA HARBOR ▲▲▲



plates are especially designed to discharge the slabs without undue shock to the table. Each furnace has a rated capacity of 50 tons per hr.

This mill was supplied by the Mesta Machine Co. and is designed for rolling plate from 3/16 in. to 1/2 in. in thickness and up to a maximum width of 69 in. For continuous strip the width varies from 24 in. to 66 in., depending upon order requirements and gage. The mill has a rated capacity of 100 tons per hr. on 16 gage, 48 in. wide.

The furnace delivery table is of an exceptionally heavy design, having rollers 14 in. dia. by 6 ft. long. The first stand is a scale breaker with 23 in. dia. rolls, 76 in. long. On the delivery side of the scale breaker is an optional transfer to a slab turn-over for further removal of scale. The first mill stand can be used for cross rolling for spreading and is provided with 36 in. dia. working rolls and 49 in. dia. backing up rolls

CONSTRUCTION of Inland Steel Co.'s new continuous plate and sheet strip mill at Indiana Harbor, Ind., has been completed and experimental operations were started several weeks ago. The installation embraces the most modern and highly perfected developments of continuous sheet strip production. Actual foundation work for the mill buildings was started in April, 1931, and the mill was placed in operation nine months later.



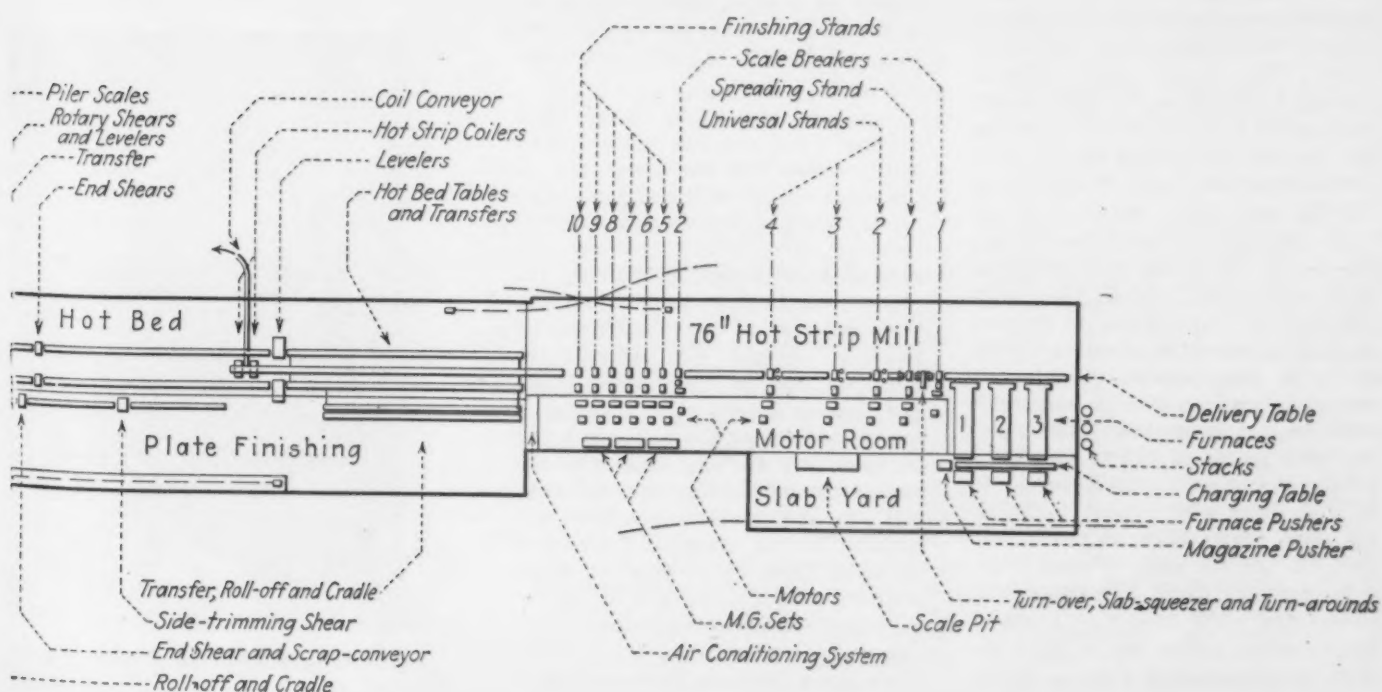
having a length of 96 in. The mill is served by turntables and an electric pusher for delivering the slabs square into the rolls. In front of No. 1 stand is an electric hydraulic slab squeezer for correcting widths and squaring edges.

Mill stands Nos. 2, 3 and 4 are of the four high universal type having 25 in. dia. working rolls and 49 in. dia. backing up rolls with a length of 77 in. and vertical rolls on the entrance side. These four stands constitute the roughing end of the mill. Approximately 100 ft. away from No. 4 stand the finishing group starts. In front of this there is another scale breaker of the same size as No. 1.

Finishing stands, Nos. 5 to 10 in-

clusive, are four high with 24 1/2 in. dia. working rolls and 49 in. dia. backing up rolls with a length of 77 in. Between each stand is a motor-operated looper. The mill stands have roller bearings on backing up rolls and working rolls and all screw-downs are motor operated through magnetic clutches. Tables between mills are of very heavy construction. All gears are enclosed and all entering guides are electrically operated.

Motors and speed reducers for the mill drives are located in the motor room. No. 1 scale breaker is driven by a 1000 hp. induction motor through a suitable speed reducer. No. 1 mill stand drive consists of a 3000 hp. 150 r.p.m. induction motor





equipped with a flywheel. The mill is driven through a gear reducer and pinion stand. Stands Nos. 2, 3 and 4 have drives composed of a 3000 hp. induction motor, flywheel equipped, speed reducers and pinion stands. No. 2 scale breaker is driven by a 500 hp. variable speed d.c. motor.

Finishing stands 5 to 10 inclusive are individually driven by 3500 hp. adjustable speed d.c. motors through speed reducers and pinion stands.

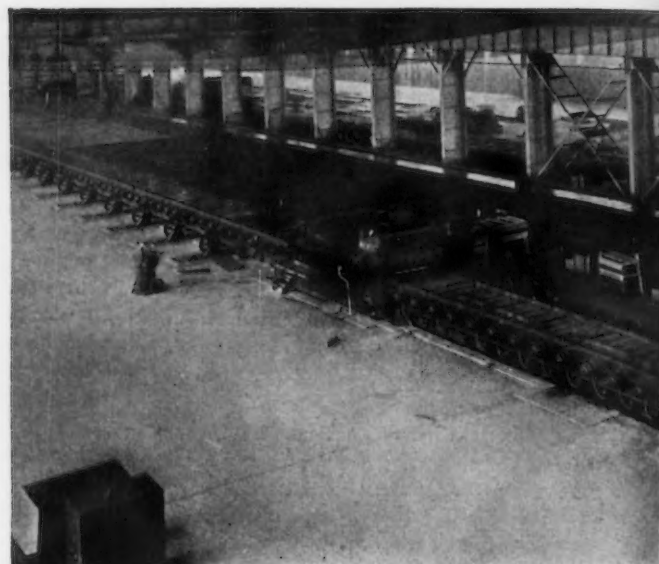
Power is provided from the plant power station and enters the motor room at 6600 volts, 3 phase, 25 cycle. For the d.c. motors on the finishing stands three 5000 kw., 6600 volts a.c., and 600 volts d.c., motor-generator sets have been provided. Interesting accessories for the mill proper consist of two 1000-gal., 1000-lb. pressure hydraulic pumps for scale removal, automatic oiling and greasing systems, and air filtering systems for motor drives.

Leaving the hot mill building the strip is carried to the hotbed in the finishing building on a run-in table 340 ft. long, having individual variable frequency induction motor-driven rollers giving table speeds 345 to 1380 f.p.m. This center table extends through to two 66 in. hot strip coilers discharging to a coil conveyor leading into the cold mill group by way of a tunnel under the 75-ft. thoroughfare.

From the center table a double chain transfer is connected to two side tables on hotbed runout tables, 38-ft. centers and 250 ft. long, with standard mill type drives, at the end of each of which is placed a 76 in. by ½ in. plate leveler. The leveler runout tables are 256 ft. long with individual motor-driven rollers giving table speeds of 112 to 448 f.p.m. At the end of each is a 76 in. by ½ in. end shear with runout tables of the same construction at the leveler runouts. At the ends of each is located a rotary flying cold shear with leveler and pinch rolls with capacity for shearing plates up to 3/16 in. thick into lengths of 6 ft. to 18 ft.

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THE six finishing stands
are in the foreground.
The roll train consists of
ten stands in line.

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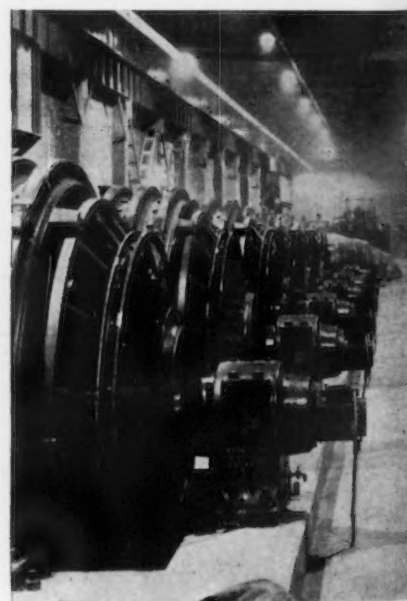


Flying shear run-out tables discharge

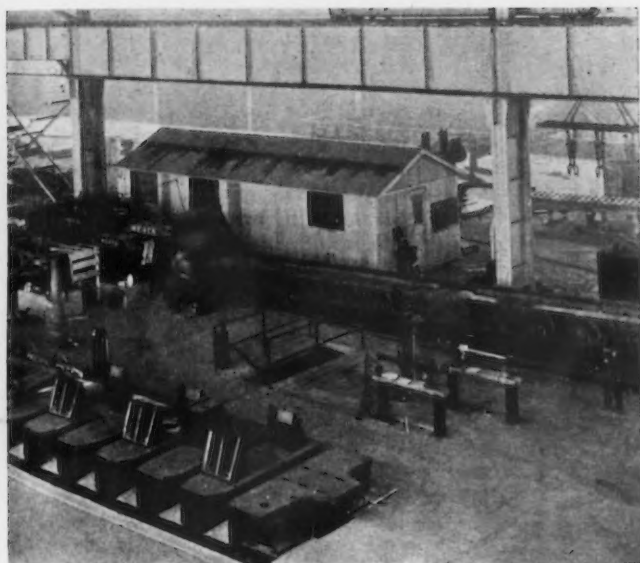
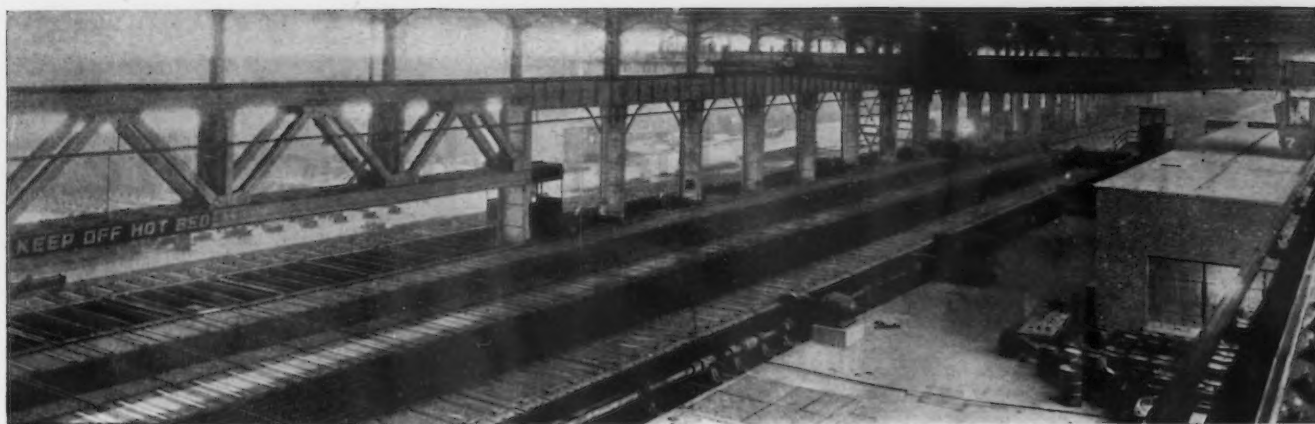
and widths up to 60 in. The flying shear runout tables, each 40 ft. long and with individual motor-driven rollers, have tilting devices and discharge on to piler tables with scales. A transfer car takes the plates to the shipping dock in the adjoining plate finishing building.

Heavier plates up to ½ in. thick are run down one side table, leveled and sheared. At the lower end of the shear runout table and just ahead of the flying shears is a plate cross transfer, 100 ft. long, between the two lines of tables, permitting the plates to be brought back to the side table adjacent to the plate finishing building. At this side table at the incoming end of the hotbed building another 100-ft. plate transfer is located, delivering the plates to a roll off table, 216 ft. long, located in the plate finishing building equipped with roll offs and cradles. The piles are handled by the crane and deposited on skids, from which they are delivered one at a time to a 72-in. by ½-in. rotary side trimming shear. The side shear runout table, 104 ft. long, feeds into a 76-in. by ½-in. end shear

with pinch rolls and scrap conveyor. The end shear runout table, 36 ft. long, connects to the scale table unit with scales, 50 ft. long, followed by



Motors, speed reducers and motor-generator main mill



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STRIP is carried to the hot bed on a run-in table 340 ft. long. A double chain transfer moves strip to either of two side tables.

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to piler tables with scales.

a roll off table, 100 ft. long, with roll offs and cradles.

The plate finishing building has ample warehouse space with de-

pressed track and shipping dock. In addition facilities have been installed for pickling, annealing and cold drawing.

The new plant will permit Inland Steel Co. to produce all grades and finishes of sheet steel, hot and cold rolled strip 6 in. and over in width and universal mill plates up to 69 in. wide.

Ice-Cooling of Air— A New Steel Outlet

AIR-CONDITIONING and cooling by means of manufactured ice now gives promise of developing to a point where the needed equipment will lend measurable support to the iron and steel industry. The National Association of Ice Industries, Chicago, has prepared under the direction of Emerson Brandt, secretary of the technical department of the association, a complete manual covering engineering service, form of proposal, suggestions for sales organizations and the like which is designed to give to members of the association the information needed to push this use for

their commodity. Plumbers, heating and ventilating engineers and architects are to be given full cooperation by the association.

A sufficient number of key installations have been made and are in operation to lift the proposition far above the experimental stage. Applications of ice cooling are in a measure without limit because investment and operating costs are not excessive. This equipment finds ready application in homes, departments and offices in industrial institutions, also in theaters, restaurants, stores, business offices and in business buildings.

The possibilities are illustrated by a survey made at Kansas City, Mo., where it was found that "iced comfort cooling," if applied only to small industries as well as to offices, stores, restaurants and theaters of the medium and better class, would result in an increase of 60 per cent in the use of ice in that city.

The association estimates that about 2,000,000 homes can afford the comfort of ice cooling on the basis of an average installation costing \$700 and using 20 to 30 tons of ice a season at \$5 a ton.

Equipment varies somewhat with the character of conditions to be met. Galvanized sheets will be used inside and outside of the ice tank, which will be insulated. In many cases ice chutes to the tank will be made or at least lined with sheet metal. The air washer will also be made of sheet metal. A motor-driven fan will distribute cooled air to various registers through sheet metal ducts and similar ducts will return the air for recooling and rewashing. Appreciable quantities of pipe will be needed for spray heads in the ice tank and in the air washer. A motor-driven pump will draw cooled water from the bottom of the ice tank and discharge it through spray heads in the air washer. Another pump with necessary piping will return the water from the washer to the ice tank spray heads.

Growth in application of ice cooling will also lead to increased public utility load and greater activity among manufacturers of ice-making machinery, which will have its effect on the iron and steel industry.



sets are housed in a building parallel to the structure.

Properties Which Characterize Chromium Plating

By DR. R. J. PIERSOL
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Pittsburgh

CHROMIUM has been heralded as the "wonder metal" of the present time. This has been due primarily to a unique combination of physical characteristics of plated chromium. These properties include diamond-like hardness, remarkable adhesion to certain foundation metals, high coefficient of light reflection, low coefficient of friction, and high temperature resistance. In addition, chromium possesses the chemical properties of non-tarnishing and resistance to alkalis and all common acids, with the exception of hydrochloric and certain critical concentrations of sulphuric acid.

These qualities of chromium naturally have opened two distinct fields for the application of electro-deposited plate. The first is a thin coat of bright chromium, usually over polished nickel plate, for ornamental purposes. The second is a thick deposit of either bright or dull chromium on a hard foundation metal for abrasion, corrosion, or high-temperature resistance.

Although chromium is playing a most important role in both high-speed steel and rustless iron, this discussion will limit itself to chromium plate only because the function of chromium in an alloy is different from that in a surface coat.

The iron industry is interested intensely in the so-called "hard chromium." Although hard chromium holds unlimited possibilities, this application is of such recent date and the technique is so exacting that it will require research and scientific plant control to make each particular type of plated article a success. In order to establish a basis for decision as to the suitability of chromium for various purposes, it is worthwhile to consider carefully the different physical properties of chromium.

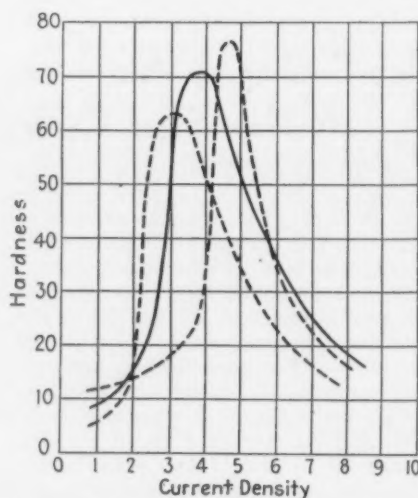
Abrasive Hardness

It is natural that the layman should expect hardness to have a specific value for chromium with an absolute

CHROMIUM, the so-called "wonder metal" of the present, has many distinguishing properties when used as a plating material. Some of these, discussed by the author, are abrasive hardness, crystalline structure, brittleness, coefficient of reflection, temperature resistance and coefficient of friction. How difficulties as to porosity and adhesion to the base metal have been overcome are also outlined.

constant, such as specific gravity for example. Instead chromium has an exceedingly wide range of hardness, from as low as copper to as high as the hardest alloy steel. For instance, metallic chromium, made in a reduction furnace, may be scratched with a finger nail. Likewise a chromium plate may have a corresponding range of hardness, depending on conditions of deposition.

The writer was the first to make a quantitative study and publish results on the influence of current den-



Influence of current density on the hardness of chromium.

sity on the hardness of chromium. A typical curve showing this relation, here reproduced, expresses the current density in amperes per square inch and the hardness in minutes required to cut through a plate 0.001 in. thick. The dotted curves show the change in hardness by the variation in temperature. Also, changes in hardness are caused by the additional interrelated variables of concentration of chromic acid, the sulphate, the trivalent chromium, and the iron content.

With a machine which the writer developed for a quantitative abrasive hardness test on electro-deposits, it is found that the hardest chromium has 1.2 times the hardness of the hardest metallic tungsten, 1.8 times the hardness of the hardest tool steel; and three times the hardness of nitralloy. In industrial operation, the hardest chromium has about seven times the average life of an equal thickness of the hard alloys.

Since commercial plates of hard chromium usually are limited to from 0.001 to 0.10 in. in thickness, it is evident that the best application of hard chromium is under conditions where the permissible surface wear is comparable to the thickness of the deposit.

Crystalline Structure

From the scientific side, it is of interest to note that chromium tends to crystallize in a cubical lattice. But from the practical angle, it is of more importance to study the influence of the different operating variables on the texture of the chromium.

In chromium plating, hydrogen is liberated coincident with the deposition of chromium. Due to osmotic pressure, the hydrogen is shot off with a projectile-like velocity and, therefore, is driven into both the chromium plate and the foundation metal in large quantities. Chromium has a high affinity for hydrogen and thus may absorb several hundred volumes of this gas.

The texture of the plate is related very closely to the ratio of the chromium deposited to that of the hydrogen liberated. For instance, exhaustive tests on current efficiency have proved that the optimum value of current efficiency for a brilliant deposit is about 13 per cent chromium efficiency and, therefore, 87 per cent hydrogen efficiency, if the small amount of current consumed in the partial reduction of the chromic acid is neglected.

Research shows that any variation of the operating conditions which affect this chromium-hydrogen ratio not only changes the brightness, but also influences the hardness of the chromium. This extreme hardness, associated with large hydrogen liberation, may be referred to in terms of hydrogen hardening. But regardless of nomenclature, the concurrent plating of chromium and hydrogen apparently set up crystal stresses which are evidenced by hardness.

Tests show that the hardest deposits are formed at unusually high current densities, thereby necessitating large motor-generator capacity. Where only a lustrous surface is desired, relatively low current densities, of the order of 100 amp. per sq. ft., may be used.

Porosity of Deposit

In applications in which the purpose of chromium is to prevent tarnishing or corrosion, it is of prime importance that the plate be impervious so that the foundation metal will not be attacked. When chromium is used only for abrasive resistance the porosity of the deposit may be of secondary importance.

Since chromium gives a faithful reproduction of the foundation metal, any pin holes in the under metal will be carried through the chromium. Therefore it is necessary to close the pores of a slightly porous material

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THE author, with the first large chromium plated reflector ever manufactured. It was made in 1924.

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AUTOMOBILE bumpers (below) being electro-cleaned and plated.

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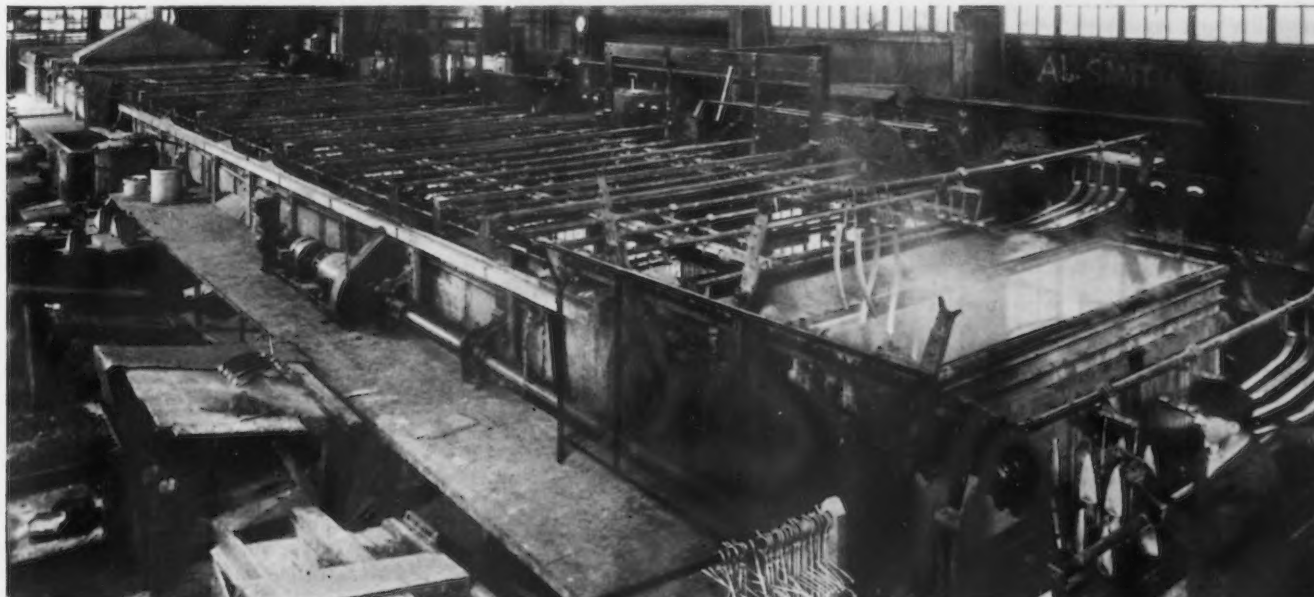
with a plate of nickel or copper. With a soft deposit of copper, an experienced polisher can flow the copper on a buffing wheel, thereby forming an impervious intermediate plate.

Under certain operating conditions an extremely porous deposit of chromium is caused by entrapped hydrogen bubbles. Also a dirty bath tends to form a porous deposit, so that continuous filtration is a desirable feature of a chromium installation.

The dogmatic statement is often

made that all deposits of chromium are comparatively porous. This is contrary to fact. Instead it is possible, by the correct control of operating variables, to plate a deposit of chromium which is extremely impervious.

An excellent test for the degree of porosity of a chromium deposit is to plate a thin coat of chromium on a highly polished thin strip of copper. Then dissolve off the copper by the use of nitric acid. The degree of
(Concluded on page 1381)



Beryllium Alloys Have Commercial Possibilities

UP-TO-DATE information on the most recent developments in the metallurgy and application of beryllium is found in a paper entitled "Beryllium," by Prof. Alfred Stock, Technische Hochschule, Karlsruhe, Germany, delivered at the sixty-first general meeting of the Electrochemical Society at Baltimore, April 21 to 23. Investigation in Germany of this comparatively new metal has been quite extensive.

It is stated by the author that the fused electrolyte process, on which the large-scale manufacture of aluminum and magnesium is based, was not successfully applied to beryllium until very recently, due largely to the very marked affinity of the metal for oxygen and carbon and to its high melting point of 1300 deg. C. The author used a mixture of beryllium fluoride and barium fluoride, operating the bath at 1400 deg. C. Molten beryllium separates at the water-cooled iron cathode. Details of the process are given. Some of the important facts of the paper relating to alloys of the metal are presented in the following abstract.

In recent years Siemens and Halske (in Germany) have carried on extensive and systematic investigations of the practical utilization of beryllium and its alloys. On account of the high cost of the pure metal and on account of its brittleness, which makes it difficult to work, beryllium is not likely to become a metal for general use, however attractive it may be because of its lightness. The statements in the press concerning the use of beryllium in aeronautical construction must be regarded as fantastic.

However, the distinctive properties of the metal make it most valuable for a variety of special uses. For example in X-ray tube construction, beryllium's transparency to X-rays (nearly 20 times that of aluminum) has brought about the introduction of beryllium windows (2 cm. diam. x 1 to 2 mm. thick) in such tubes. The high reflectivity of the metal for ultra-violet light, and its very low tendency to sputter in cathode ray tubes, are likewise valuable charac-



teristics. The beryllium arc has been used for photochemical purposes.

Metallic beryllium may be electroplated upon copper, nickel, iron, aluminium and alloys of the light metals by using a melt of an alkali fluoride and beryllium oxyfluoride. By keeping the bath at proper temperature, and subsequently heat-treating

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SOME FACTS ABOUT THE ALLOYS

SMALL additions of beryllium to copper have resulted in surprising properties as to temperature and hardness.

Beryllium bronzes are about as resistant to corrosion as the tin or aluminum bronzes.

Probable commercial value for the beryllium-iron alloys is indicated by recent researches. Alloys of iron, chromium, nickel and beryllium show chemical resistivity corresponding to the rustless steels with excellent hardness, strength and elasticity.

As a deoxidizing agent in the casting of copper, beryllium has proved to be of commercial importance. It increases the conductivity of cast copper.

Cost of beryllium has been reduced to \$8 from \$30 per lb. Further reduction is expected from more extensive use.

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the deposited metal, it is possible to obtain a superficial alloy of beryllium with the underlying metal, resulting in firmly adherent coatings having the properties of the respective beryllium alloys.

Beryllium as a Deoxidizer for Copper

Beryllium as a deoxidizing agent in the casting of copper has proved to be of commercial value. A few hundredths of one per cent of phosphorus, heretofore most commonly employed as the deoxidizer, cause a marked decrease in the electrical conductivity of the copper. On the other hand 0.01 to 0.02 per cent of beryllium, which combines with nearly twice its weight of oxygen, is an excellent deoxidizer for high conductivity copper castings. Besides the high conductivity, the casting is dense, smooth and flawless.

Thus for example, a sand-cast copper, which is usually of relatively low conductivity, can be produced with a conductivity which is but slightly lower than that of drawn electrolytic copper. In other words, the conductivity of ordinary cast copper may be raised by as much as 20 per cent. When beryllium is employed for this purpose, it is added in the form of an alloy with copper, containing 10 per cent Be. This alloy is prepared directly by electrolysis as will be described below. Furthermore, a cheaper electrolyte than the one described above, one containing some aluminum as an impurity, may be employed. The high cost of the beryllium employed is further offset by the increased conductivity of the castings so that castings of smaller cross-section and lower weight are required.

Alloys with Aluminum and Magnesium

The light alloys of beryllium with aluminum have not come up to expectation. These alloys have been investigated especially in America. There is no difficulty in preparing Be-Al alloy-castings of any composition. It is also possible to secure flawless rolled sheets (down to thick-
(Concluded on page 1383)



Industry and agriculture join hands in this Vermont plant of the American Fork & Hoe Co.

Farm Implement Manufacturer Combats the Depression

By R. C. TAFT

Manager, Batcheller Works, American Fork & Hoe Co., Wallingford, Vt.

As told to Francis A. Westbrook, M. E.

IN our endeavor to meet the unprecedented conditions resulting from the current depression of business we are making simultaneous efforts. The first of these is for the protection and self-help of our workers, the second the improvement of our production processes and the third for an improved sales program in our Eastern trade area. To give a clear idea of how these efforts are being prosecuted I will discuss each one in turn, in the order given.

The advantages of having an industrial plant in a small town in a farming community has been well illustrated during the past year by the experience of the Batcheller Works of the American Fork & Hoe Co. at Wallingford, Vt. In the May 14, 1931, issue of IRON AGE the situation of this operation with respect to the employment problem and how it had been handled up to that time was described and commented upon. Since then there have been new developments which appear to us to be both significant and suggestive.

As a matter of general policy we have continued along the lines explained in the previous article. That

THE "Cellar-Full-of-Food Club" is but one of the novel ways in which the Batcheller Works of the American Fork & Hoe Co. is attempting to combat the depression and to mitigate its hardships upon the employees. In addition to encouraging self-help for the workers, the company is improving both its production processes and its sales program.

is, we practically shut down during a good part of last summer when many of the men could find work on the farms during the haying season, work in their own and other people's gardens, and otherwise get along with a greater degree of security than would be possible in winter. During the closed season the Sales Department did its best, as during the previous year, to accumulate as many orders as possible so as to build a backlog of activity for the winter.

However, during the first year general business conditions, newly enacted foreign tariffs, and other

factors have resulted in still more reducing our total volume of production. This has made it necessary to further spread the work available by the stagger system and the selection of the heads of families and others with dependents for the handling of what work there has been.

Wage Rates Not Reduced

We have as yet put through no general reduction in wage rates, for the short time schedule of two and three days work per week has so reduced the real wages that we have not had the heart to cut the rates in addition to cutting the time.

Individual members of the community have also cooperated in wonderful fashion in helping themselves in all available ways. This has been especially true in the matter of securing wood from the woodlots with which the mountains all around our valley are covered. This natural fuel supply has been worked in such volume that it has become a real economic factor in our community life. We have cooperated with the men to the extent of offering the use of the

(Concluded on page 1382)

What Will Industry



Do With the Technical Graduate?

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SENIORS at Columbia College expect to be making \$11,350 a year within five years after they have graduated, according to this year's class poll, but in some other schools the graduating classes are not so hopeful. Technical graduates, in particular, are facing a serious problem this year when manufacturers have altered a policy previously well established to take a definite number of graduates each year into their ranks.

One of the leading technical schools of the country reports that only 3.4 per cent of its graduates had located positions previous to graduation, whereas in past experience from 40 to 50 per cent had been placed by that time. This school enjoys excellent relations with manufacturers and this year was in contact with from 250 to 300 companies endeavoring to place its graduates. Another school reports that the only positions secured by its graduates this year are with highway commissions.

The results of a questionnaire sent to technical schools indicate that an average of about 5 per cent of the 1932 graduates had positions at the time of graduating. This compares with an average of about 25 per cent in recent normal years. The number of 1932 technical students graduating is about the same as for 1929 and the number enrolled at the schools replying is about 105 per cent of the 1929 figure. On an average, 130 industrial companies have been contacted in an endeavor to place graduates by each of the schools interviewed. One school states that this year it carried on correspondence with an additional 250 companies. This same school with its widespread experience reports the large companies are taking few graduates or none at all and that the only possibility of placing 1932 graduates seems to be with small companies who may take one or two men here or there. All in the selected group of schools have enjoyed excellent co-

THIS summer a new army of technical graduates some 10,000 strong will be seeking its place in the industrial life of the country. Does industry need these young men? In past years manufacturers have sent representatives to technical schools to pick out groups of men to bring new energy, new youth and new ideas into their organizations. This year things are different and even the large manufacturers are inclined to ignore the new technical graduate. Obviously here is a problem of industrial as well as social significance. The accompanying article, based on the results of a questionnaire sent to leading technical schools and to representative manufacturers, analyzes the situation and presents some of the suggestions received.

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operation with industry in the past in the placement of graduates.

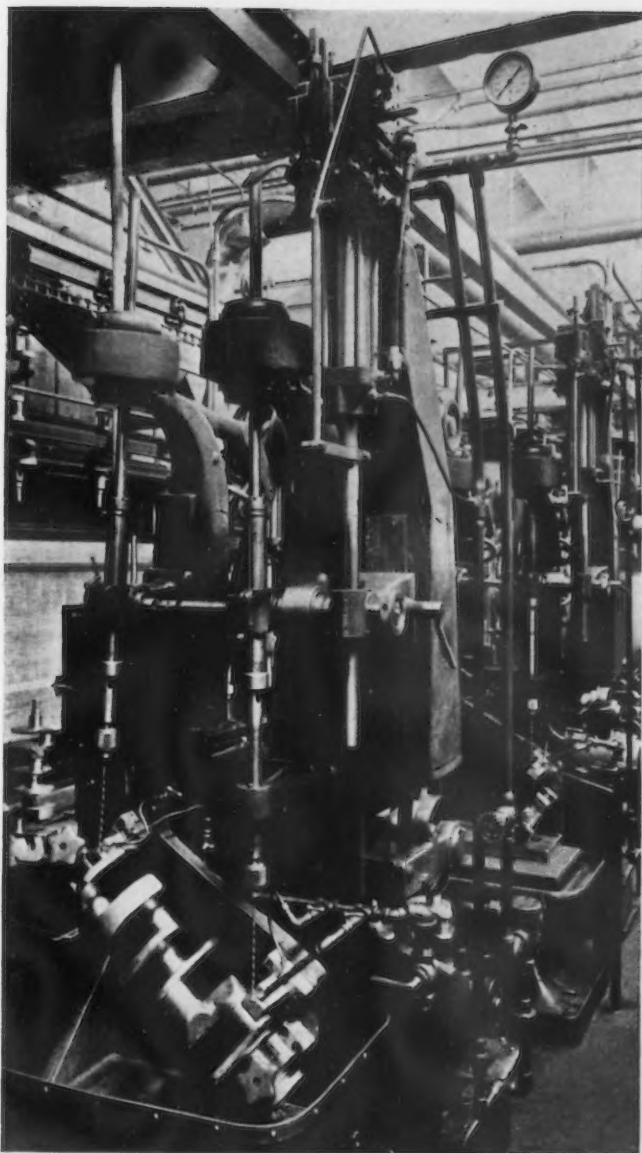
Few Graduates Taken by Metal-Working Plants

A representative group of manufacturers in the metal-working field was sent a questionnaire similar to that sent to the technical schools. Of these companies not a single one had any definite plan for adding graduates to its personnel this year. A few expected to take one or two for some special reason. In most cases this reason was family connection. Perhaps the father of the graduate occupied an executive position with the company or a brother had influence. A leading manufacturer says, "We do not plan to take any college graduates this year. In the past we have added to our force from 50 to 90 technical graduates each spring." Another manufacturer states, "We have had an

apprenticeship course in the past, but have suspended it and do not plan to take any graduates into our employ at this time." Another company reports, "On account of the industrial situation we have not been able to place all of the graduates who entered our training corps last year and we feel that our first obligation is to place these graduates who have been receiving training for a year or more." This particular company conducts a regular training school for young men wishing to enter its employment. In the past this training school has been regarded as an important manufacturing asset.

Another manufacturer states in connection with this perplexing problem, "A very definite need exists in industry for the development of a group of men who are broadly familiar with the business. Specialization has emphasized this need. Competition is changing it into a demand. As a result a new type of apprenticeship is being developed somewhat similar to the earlier type but on a higher plane. During recent years of expansion our company has developed courses for groups of men selected from grammar schools, high schools and from technical institutes and colleges. For two years expansion of these activities has been discontinued but a substantial program is still carried on. That part of the training which is based on the performance of productive work has been curtailed by reducing the number of working hours a week. Classroom activities have been increased for the apprentices in order to enable them more effectively to use the resultant additional time. The problem as we see it is one of harmonizing the immediate demand for reduced output with the future probable demand for more highly skilled and more broadly trained men. In times such as these the value of apprentice training is apparent both

(Concluded on advertising page 18)



FIVE-INCH oil holes are drilled through the crankshaft from one bearing to another on a 14-in. upright drill equipped with automatic hydraulic step-drilling unit. A setting fixture assures proper location of the oil hole in the crankshaft with the oil groove in the cylinder block. ▲ ▲ ▲

NOWHERE in the manufacture of the new Ford V-eight car is the accuracy and efficiency found throughout the Ford organization better exemplified than in the production of the crankshaft. Every crankshaft is subjected to minute inspection, mostly on Ford-designed testing devices, as it moves through the crankshaft department which is equipped with many cost-reducing machine tools of new construction. Aside from the special equipment for machining the crankshaft, the department contains special double-deck heat-treating furnaces, a "spinning" machine devised by Ford engineers for quenching work after heat-treatment to insure uniform hardness and straightness, pan-type conveyors to carry away chips from machine tools and a filtering system for cleaning the coolant supplied to machines.

As is customary in many Ford de-

partments, the crankshaft department is served by an overhead monorail chain conveyor with hooks suspended to hold crankshafts in a vertical position. Machine tools are arranged in parallel rows with the conveyor running between them and sufficiently close to the operators that they do not have to step away from their work to obtain fresh stock. There is practically no place for the storage of crankshafts, which move swiftly into and out of the department. All machines are individually motor-driven and equipped with safety devices.

Center-Drive Line Bearing Lathe Performs Several Operations

When the crankshaft comes into the department from the forge shop, both ends are centered on a special centering machine to ascertain balance as well as to locate machining points.

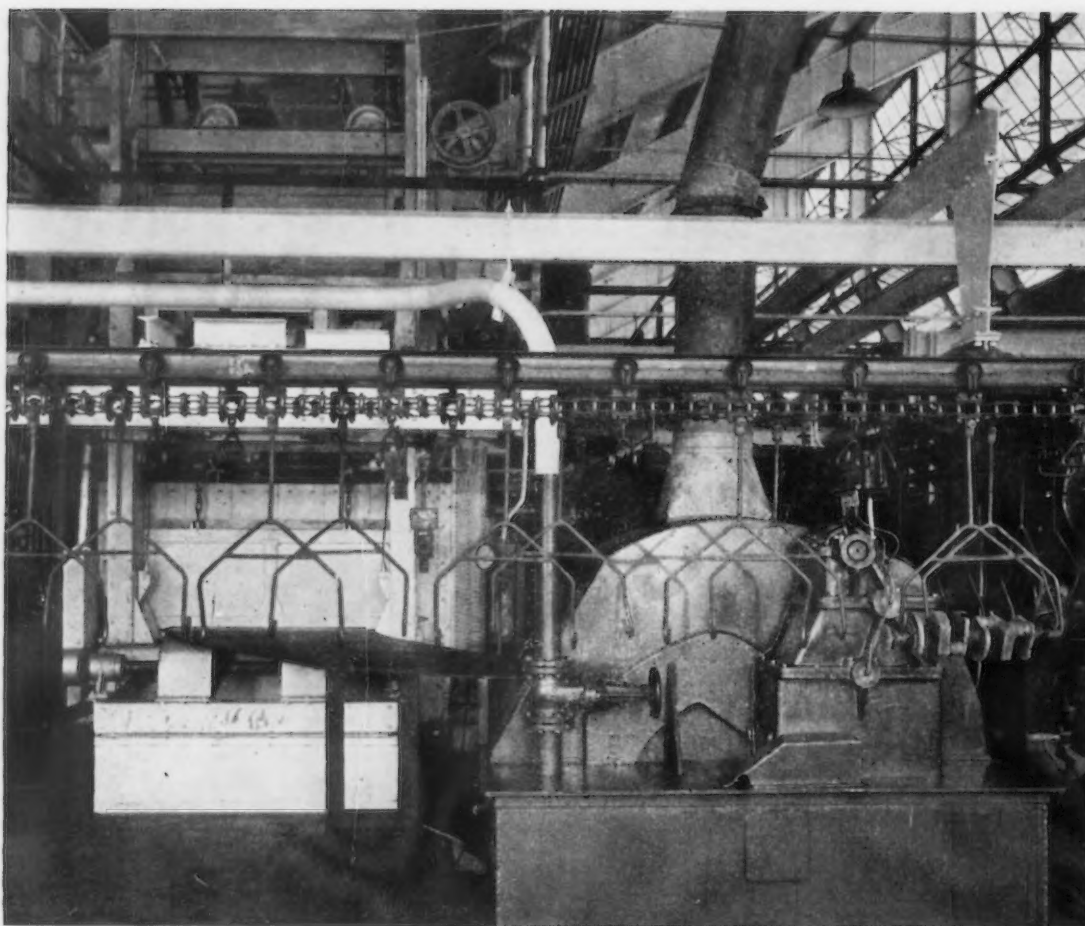
Operations on the Ford V-8 Crankshaft

By BURNHAM FINNEY



These machines are adjustable vertically and horizontally. There follows the turning of the front cheeks, front bearing diameter, time gear fit diameter and the fan pulley diameter, the turning of both cheeks of the center main bearing and center main bearing diameter, the turning of the rear main bearing cheek, rear main bearing diameter and the form of the oil slinger, straddle turning the inside and outside face of the flange and turning the outside diameter of the oil seals and of the flange. All of this work is done on a center-drive line bearing lathe. The crankshaft is placed in the lathe and dropped on the saddle under the flange and under the stub end. The centers are then brought up hydraulically, picking up the crankshaft off the saddles. The center in the flange end of the crankshaft is drilled to a fixed distance to obtain proper alignment of cheeks while machining.

On this machine the crankshaft is driven by means of equalizing driving dogs in the center drive. The center portion of the bearing is machined with a broach. Upon completion of this operation a pair of rollers is brought up against the broached portion of the center bearing in order to support the crankshaft against deflection during the work that follows. The power feed then is engaged and the front, rear and center bearings machined. Power feed is through electric motors and is automatic, providing rapid traverse to the cutting position, coarse cheeking feed, fine turning feed, rapid traverse to the unloading position and automatic stop of the machine. The lathe is automatically



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CRANKSHAFTS are normalized in a hardening furnace (lower unit) at 1650 deg., quenched in a special spinning machine (right) at 1500 deg., and drawn in the draw furnace (upper unit) at 1000 deg.

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oiled through force-feed lubricators with alemite lubrication to the sliding surfaces. This machine does the work formerly handled by five machines and turns out 15 crankshafts per hr.

Four Pins Cheeked, Turned and Filleted Simultaneously

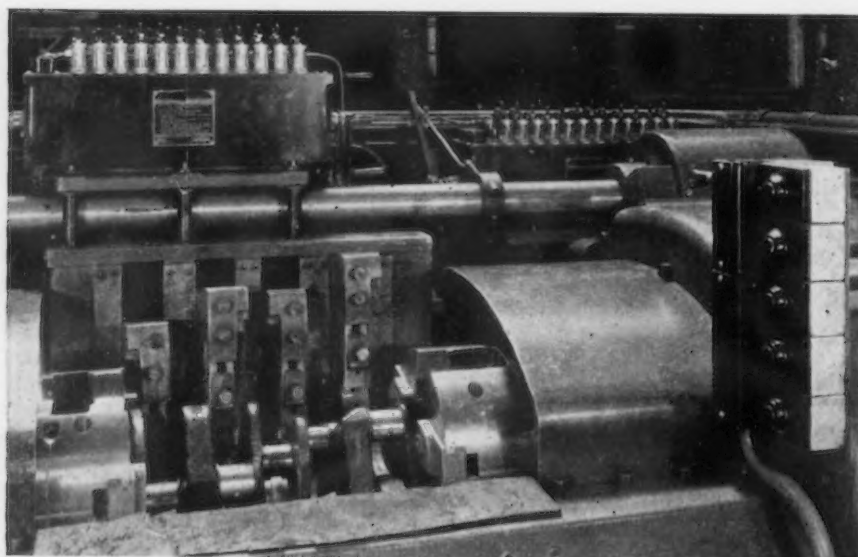
All four pins on the crankshaft are rough cheeked, turned and filleted si-

multaneously on a pin turning lathe. After heat treatment, a similar lathe is used for finish turning the pins. This lathe takes 12 cuts at one time and has hydraulically-operated chucks for holding the crankshaft in place. After the crankshaft has been chucked, the operator presses the starting button and the mechanical feed motors give the necessary se-

quence of feeding operations. The main drive for this lathe is a multiple V-belt connected to a speed reducer.

To eliminate the possibility of oil holes being out of line with the main-bearing oil groove and the connecting-rod oil groove, 5-in. oil holes are drilled through the crankshaft from one bearing to another on a 14-in. upright drill equipped with an automatic hydraulic step-drilling unit. This machine has a setting fixture to assure proper location of the oil hole in the crankshaft with the oil groove in the cylinder block. Despite the heavy character of the work, it is necessary to resharpen the drills only an average of every 15 holes, and drill breakage has been reduced almost to the vanishing point.

With the automatic hydraulic step-drilling unit, the drill cannot jump when breaking through the work. The operator starts the drilling process by moving a lever on the hydraulic unit to "on" position, the drill approaching at rapid traverse and going into feed just before striking the crankshaft. After drilling a predetermined depth, the drill reverses and backs out to its original position at rapid traverse. The drill then drills the second step, going into feed at a predetermined distance from the bottom of the hole. This process is continued until the work is completed, when an adjustable stop trips the



All four pins are rough cheeked, turned and filleted simultaneously on a pin turning lathe, which takes 12 cuts at one time. The machine is equipped with hydraulically-operated chucks, and with a force feed lubrication system.

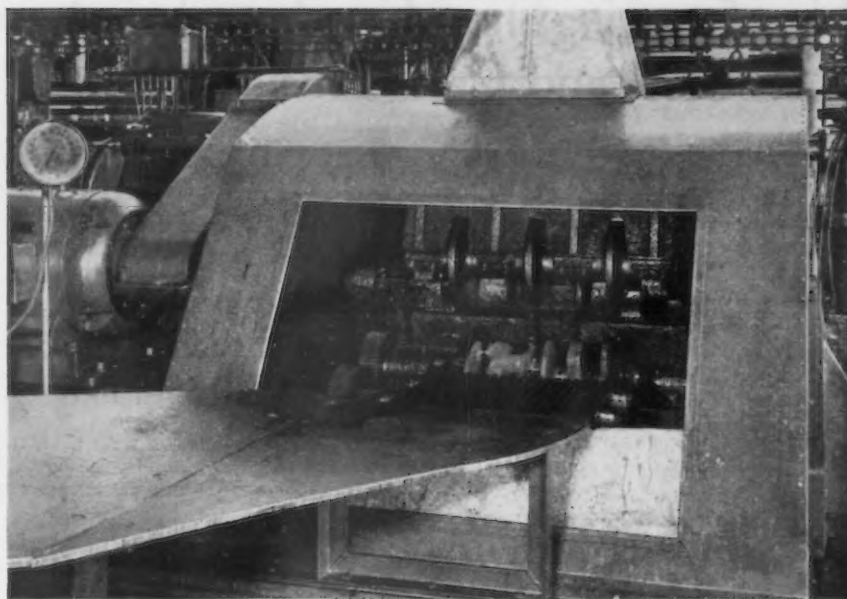
control lever to "off" position, returning the drill to the starting position.

Crankshafts Heat-Treated in Double-Deck Furnaces

For heat-treating crankshafts two special electric hardening and drawing furnaces have been installed. They are of double-deck design, the lower deck comprising the hardening unit and the upper deck the drawing unit. Crankshafts are charged into the hardening furnace by an operator who puts them by hand on to chrome-nickel alloy shoes in two lines in front of the pusher head. When the timing device on the furnace makes contact, the shoes are moved into the furnace and simultaneously a heated crankshaft is automatically removed from the discharge end of the furnace and placed within easy reach of the quenching machine operator.

After being quenched, crankshafts are replaced by the operator on the alloy steel shoes, which are automatically elevated and pushed into the draw furnace. At the discharge end of the draw furnace, crankshafts are hung on an overhead monorail conveyor to be carried to the next operation, while the shoes move to the operator at the charging end of the hardening furnace. The heat-treating cycle, therefore, is automatic, except for the initial loading of the crankshafts as they enter the hardening furnace and for the operation of the quenching machine.

Crankshafts are normalized at a temperature of 1650 deg. F., quenched at 1500 deg. and drawn at 1000 deg.



Crankshafts are quenched in a Ford-designed spinning machine. They are held rigidly in a fixture to prevent twisting or warping while revolving at the rate of 480 r.p.m. The machine has three stations and is motor-operated.

The hardening furnace is powered at 700 kw. and the draw furnace at 390 kw. Ninety crankshafts an hour are hardened and drawn in these two units.

To secure uniform physical properties and to prevent twisting or warping, crankshafts are quenched in a caustic solution in a special spinning machine designed by Ford engineers. The operator takes a crankshaft from the end of the hardening furnace with

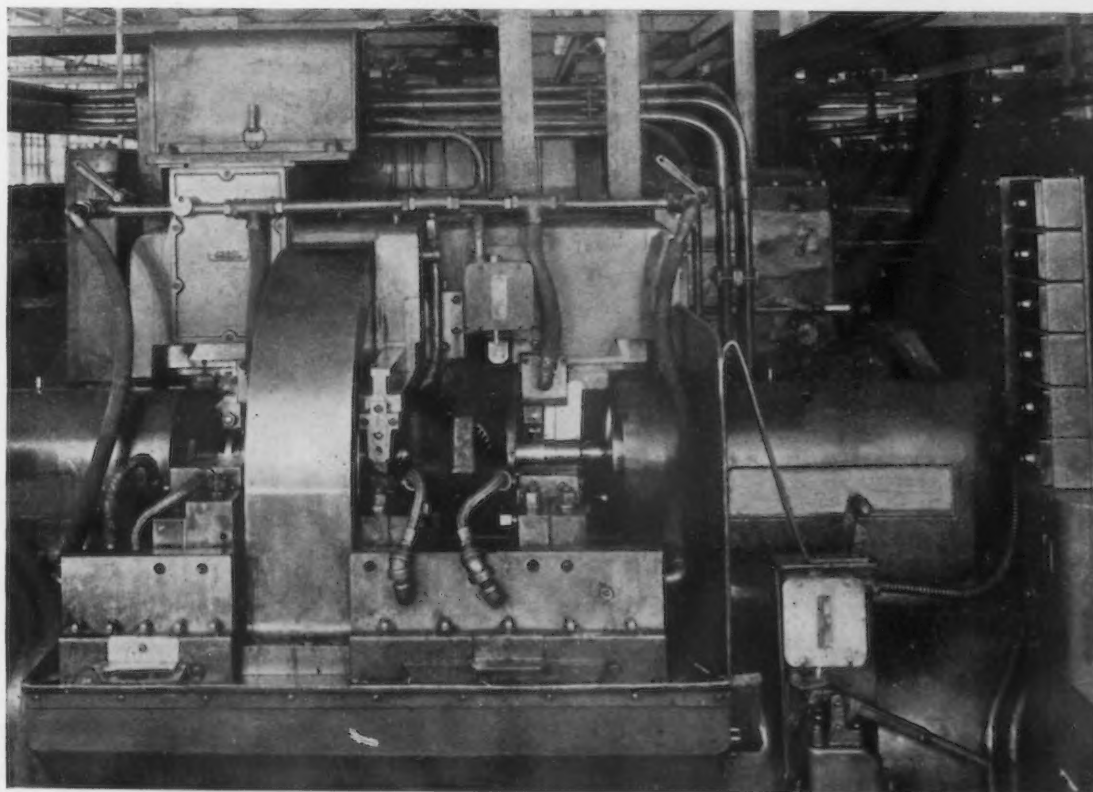
tongs and places it in a fixture in this machine, which holds it rigidly within a limit of 0.015 in. There are three contact points in the machine against which the crankshaft rests during the spinning action. That is, as soon as the crankshaft makes this contact, it begins to revolve at the rate of 480 r.p.m. The machine has three stations and is motor operated. Stations move from one position to another when the operator steps on a lever.

(To be concluded)

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THIS center-drive line bearing lathe performs a number of turning operations, doing the work formerly handled by five machines.

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New Squaring Shear Combines Structural Steel and Cast Construction

SMOOTH and accurate operation and lighter reciprocating parts that are claimed to give longer life with lower operating cost are features of a new power squaring shear introduced by the Niagara Machine & Tool Works of Buffalo, N. Y.

This shear cuts $\frac{1}{4}$ -in. plates in 10-ft. lengths, and is available with 1-in. gap or 18-in. gap in the housings. It is of structural steel and cast construction. Housings and bed are semi-steel castings and the hold-down, crosshead and transverse bar are of steel. The crosshead is of welded construction, consisting of a vertical member and a horizontal member tied together with triangular web sections for strength and rigidity. The heavy truss rod provides increased rigidity and provides a center adjustment. The crosshead is counterbalanced with large springs inclosed in cylinders; this facilitates functioning of the clutch and results in a more even application of power, which reduces the strain on wearing parts.

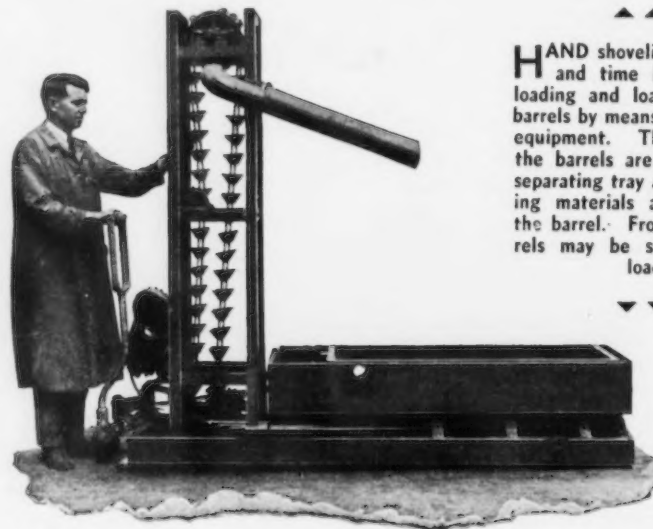
The shear is equipped with the company's individual spring foot hold-down, claimed to assure even pressure in spite of variation in the thickness of the metal being cut. It is possible to cut a $\frac{1}{4}$ -in. sheet and a $\frac{1}{16}$ -in. sheet simultaneously at opposite ends of the shear. Heavy and light sheets can be cut one immediately after the other, without making any adjustments. The hold-down pressure is transmitted to the transverse bar, relieving the main shaft of this upward stress.

Main shaft has four bearings, two in the housings and two just outside the application of load, so that the load is applied to a short well supported section of the shaft. The gears or clutch wheel and pinion have hob generated teeth. Front, back, bevel and side gages are standard

equipment and a slitting gage is furnished on the 18-in. gap shear. The back gage is self measuring to $\frac{1}{64}$ in. and can be instantly locked in the desired position. Each end is adjustable independently.

"Speed-Loader" Facilitates Barrel Burnishing

USED in conjunction with a battery of burnishing barrels, the portable motor-driven equipment illustrated



eliminates hand shoveling and waste of time in loading and unloading of the barrels.

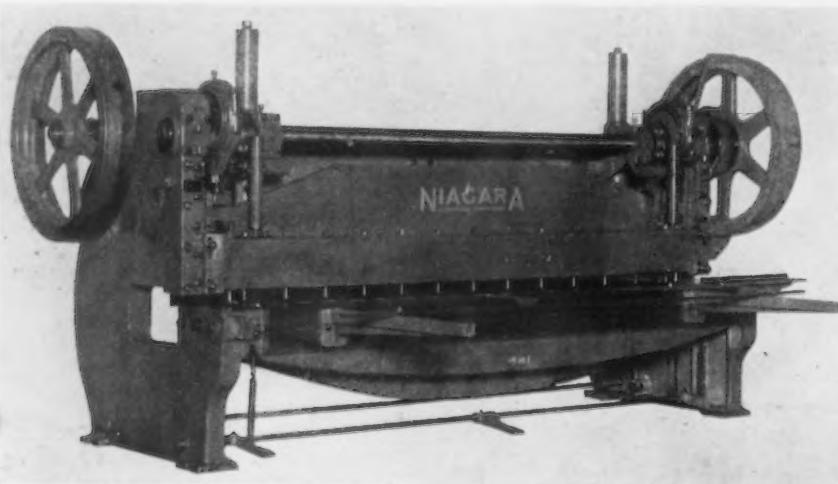
This machine, designated as the Abbott Ball speed-loader, was designed by W. R. Hartley, materials handling engineer, New Haven, Conn., and is manufactured and marketed under license by the Abbott Ball Co., Hartford, Conn. It is an L-shaped

unit consisting of a steel tower and a base mounted on three 5-in. roller-bearing casters. Rolled into position, the base extends under the burnishing barrel, the contents of which are emptied into a separating tray that sets in a hopper mounted on the base. The upper side edges of this screen-bottomed tray are flanged to rest on steel rollers mounted on the hopper. This facilitates riddling, burnished articles being retained in the tray while the burnishing materials drop through the hopper, from which they can be returned to the barrel without removing the tray. This storage hopper is provided with a screen that permits all compound or water to drain off the balls. Reloading of the barrel can be started while the previous load is still being riddled. A special elec-

HAND shoveling is eliminated and time is saved in unloading and loading burnishing barrels by means of this portable equipment. The contents of the barrels are dumped into a separating tray and the burnishing materials are returned to the barrel. From 2 to 16 barrels may be serviced by this loader.

tric motor drives the conveyor system through a speed reducer.

Levers operate four rustless steel gates in the bottom of the hopper. The design of these gates prevents overloading as the burnishing materials are admitted to non-corrosive malleable iron conveyor buckets that form a continuous belt (patent applied for), controlled by a rustless steel guide sheet underneath the hopper. The buckets carry the burnishing materials to the chute at the top of the tower, where they are discharged into the burnishing barrel. It is stated the machine will serve from two to 16 burnishing barrels, depending upon the nature of the work.



Rigidity of construction and lighter reciprocating parts are obtained by combining steel and cast members.

The Regorod welding rods and electrodes recently announced by the Bastian-Blessing Co., 240 East Ontario Street, Chicago, are described in a new 22-page catalog. The line includes gas welding rods, bare and flux coated electrodes, and cast-iron, bronze, tobin bronze and aluminum welding rods. Regite, an alloy of tungsten and molybdenum for hard surfacing, is also described, as well as fluxes, welding torches, hose and other Rego apparatus and supplies.

New Rotary Forging Furnace Has Water Seal

AN interesting development in forging furnace construction is shown in the rotary furnace for oil or gas firing brought out by the Gas Machinery Co., Cleveland. In this furnace atmospheric control is maintained by a water seal which serves to prevent infiltration of air and by syphon vents in the side walls to carry away any water vapors.

The furnace has been designed to improve the quality of forgings by reducing to a minimum scale formation and surface decarburization,

thus to prolong die life and to allow the finishing of forgings to closer tolerances. It is found to allow for uniform temperature control with a low thermal head.

A water trough provides the water seal. Extending into this is the dam plate fitted on the outer circumference of the rotating hearth. The power consumed in the movement of the dam trough is of course inconsequential. Cooling water is circulated around the circular trough and any water vapors or infiltrated

air are discharged to the atmosphere with the waste gases from the furnace through circular flues and syphon vents in the side walls.

The water trough is partially covered by a heavy steel plate ring welded to the outer wall of the trough and supported from the floor of the trough by gusset plates. A ring made of cast iron segments with lugs cast on the under side rests upon the steel shelf formed by the steel plate ring and these form an annular flue extending the entire circumference of the furnace. The vents in the side walls extend downward to this flue. Waste gases leaving the furnace through the usual ports create a slight suction in the flue and draw up any water vapor or infiltrated air also into the flue. The vapor and air liberated from the water are thus disposed of without entering the heating chamber.

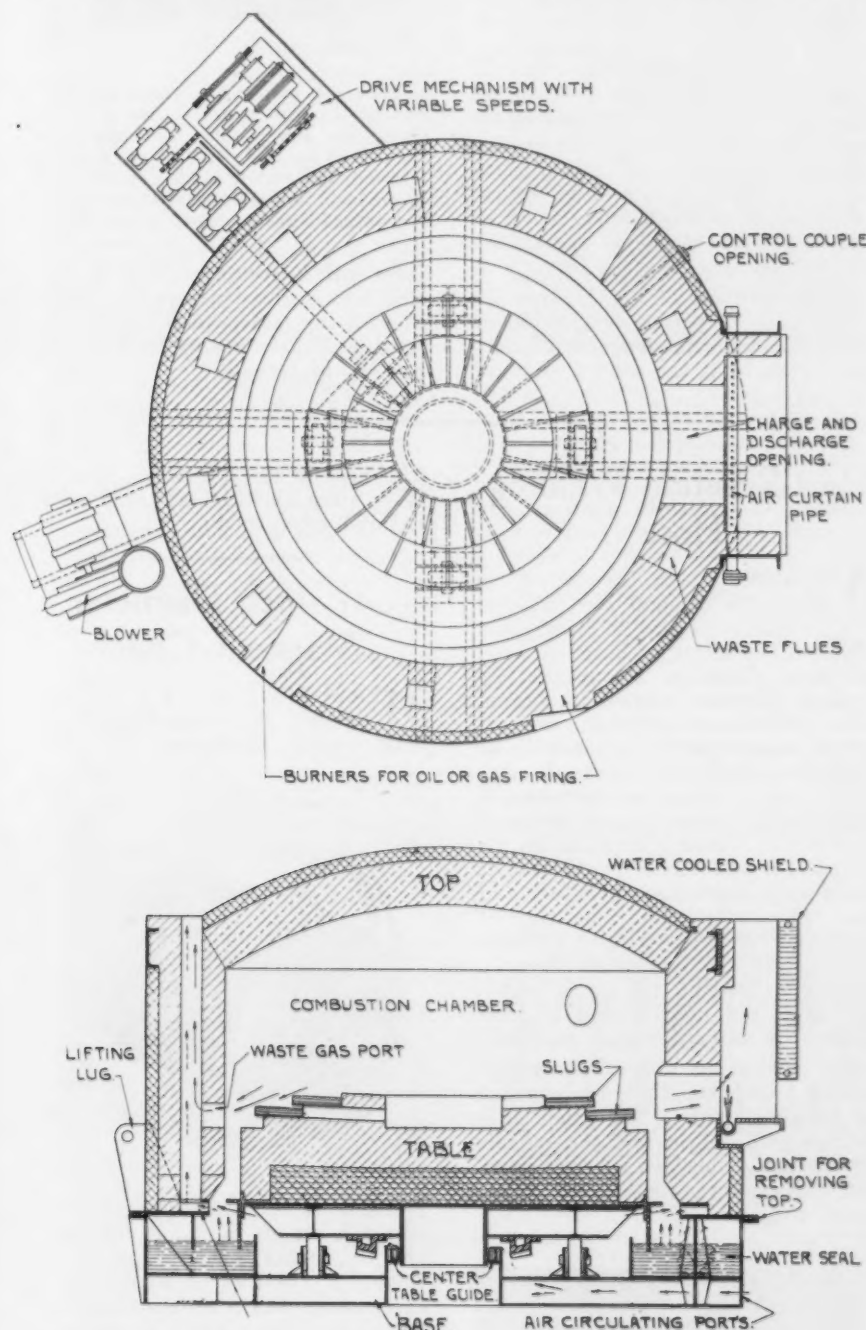
Research and plant operations have shown that the most economical operation of a forging furnace is attained when a neutral furnace atmosphere is maintained. Tests, it is stated, have proved that a furnace atmosphere containing from 0.5 to 1.5 per cent carbon monoxide and no oxygen should be maintained to insure heating the steel with a minimum of scale and surface decarburization, at the same time using a minimum of fuel. Burners in the new furnace are located sufficiently high above the stock to secure thorough combustion before the gases contact the stock. These products of combustion are found to constitute an effective protection against scaling and to supply the desired atmospheric conditions.

Work Close to Furnace Temperature

The work is placed directly upon the hearth, which is at furnace temperature. The under side of the piece is heated by conduction while the exposed side and top are heated by radiation. Thereby, it is pointed out, rapid and uniform heating and minimum internal strains are assured. The temperature of the heating chamber is maintained only slightly higher than that to which the stock is heated and this small temperature gradient between the stock and the furnace temperature under normal conditions serves also to eliminate the formation of slag.

The furnace has a single opening for charging and discharging stock, with all that this means for minimizing black body radiation losses and eliminating atmospheric drafts through the furnace. The one operator, who handles the product to and from the furnace, is protected from the heat at the charging opening by a water cooled shield and air curtain pipe.

Advantages claimed for the rotary forging furnace include its ability to heat pieces to a high temperature without danger that they will fuse



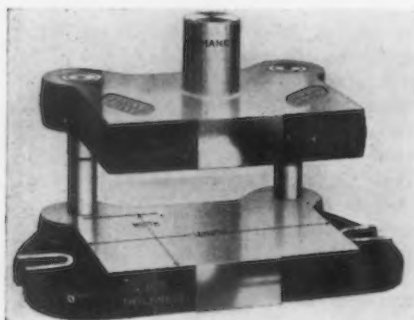
Furnace developed by the Gas Machinery Co. has water seal, arrangements for siphoning off directly vapor and any air liberated from the seal, and close control of furnace atmosphere with a low temperature gradient in the heating furnace.

and stick together, as they are placed on the revolving hearth with spacings between each piece. Also it is not necessary to feed dummies through to push out the stock at the end of the run. The circular construction of the heating chamber, it is pointed out, provides a minimum wall area resulting in low standby losses and high net thermal efficiency. The burners are located in the side wall of the furnace and the pieces on the rotating hearth pass through the hottest portion of the heating chamber just prior to reaching the discharge point. The flow of hot gases is counterwise to the direction of the table travel so that these gases are held in the heating chamber until a maximum amount of heat has been released.

The motive power for operating the table is for heavy duty service. Equipment includes full automatic temperature control. In the smaller sizes the top section of the furnace is removable from the flange connecting it to the cover of the water sealed trough. The furnaces are self contained units and do not require pits or special foundations. Patents are pending on this furnace.

Drop-Forged Steel Die Sets

E. A. BAUMBACH MFG. CO., 1218 E. South Kilbourn Avenue, Chicago, has placed on the market a new line of steel die sets, the die shoes and punch holders of which are drop forged from 0.35-0.40 per cent carbon steel which is completely normalized. Shanks are drop-forged as an in-



tegral part of the punch holder. Working surfaces are accurately machined and ground. Punch holders are fitted with bushings made of high content manganese steel, carbonized, hardened, ground and lapped to an individual fit on each hardened and ground leader pin of the corresponding die shoe.

General information in regard to the occurrence, production, properties and use of molybdenum is given in Economic Paper 15, by Alice V. Petar, just published by the United States Bureau of Mines.

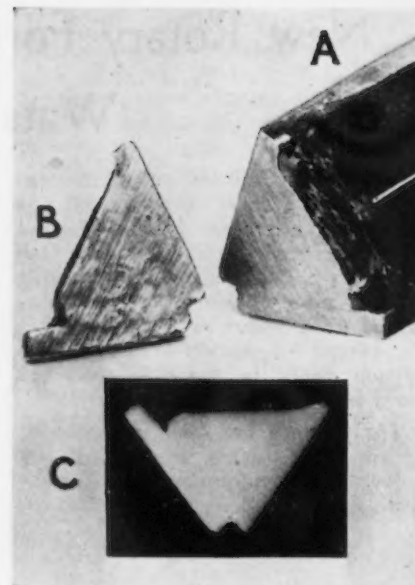
1354—The Iron Age, June 23, 1932

Offers Improved Welding Rod for 18-8 Rustless Steel

FOR use in welding Allegheny metal and other rustless steels of the 18-8 type, Joseph T. Ryerson & Son, Inc., Sixteenth and Rockwell Streets, Chicago, is marketing a new electrode. This rod is claimed to give uniformly satisfactory results, unusual performance being attributed chiefly to the special flux coating, which produces a non-active gas that surrounds the hot metal and prevents the formation of oxides. The heavy slag formed on top of the weld acts as a protective agent as the metal cools.

It is stated that when welding with this new electrode, it is unnecessary to remove the slag before the next bead is laid down. This enables the operator to work faster and at the same time secure better penetration. Tests are said to indicate carbon increase of about 0.01 per cent in the bead as compared with the original rod, the corrosion resistance of the deposited metal thus remaining equal to that of the parent metal, leaving the weld soft enough for machining.

The illustration shows a V-type fill of eight layers placed one on top of the other without removal of any slag. Piece A is the welded material



In addition to corrosion resistance and protection of the molten metal from the atmosphere, the new welding electrode permits faster work because slag does not have to be removed after each bead has been laid down. In the weld illustrated eight layers were deposited without removal of any slag.

from which section B, $\frac{1}{8}$ in. thick, was hack-saw cut across the weld. In C, an X-ray picture of B, it will be noticed that there are no blow holes, or gas or slag pockets.

Heat-Resisting Welding Hose

WELDING hose developed to meet the demand for material with unusual resistance to burst when subjected to contact with molten steel has been placed on the market by the B. F. Goodrich Rubber Co., Akron, Ohio. Submitted to 90-lb. internal air pressure, laid on crushed limestone foundation and covered with molten metal from an open-hearth furnace at a temperature of 2000 deg. F., the hose is said to have lasted for $1\frac{1}{2}$ min., a much longer time than it would be subjected to in actual service. In another test, consisting of submitting the hose without internal pressure to the discharge from a burning or cutting tip for a period of 2 min., the hose is said to have survived in unusually good condition.

The rubber in this "Fire King" welding hose is especially compounded for heat resistance. The inner plies are wrapped fabric and the outside ply consists of braided asbestos yarn. The rubber cover is $\frac{3}{32}$ -in. thick.



The hose is stocked in $\frac{1}{4}$, $\frac{5}{16}$ and $\frac{3}{8}$ -in. sizes, 50-ft. lengths, and in both red and green colors.

$4\frac{1}{2}$ -Inch Diameter Magnetic Clutch

MEASURING only $4\frac{1}{2}$ in. in diameter, the multiple-disk magnetic clutch illustrated is thought



probably to be the smallest built. Its design is unique in that it requires no brushes, brush holders or collector rings. It operates on 30-watt direct current and has a torque capacity of 600 in.-lb. The magnet is stationary. The clutch was designed by the Magnetic Mfg. Co., Milwaukee, for use in built-in machine tool drives.

PUTTING THE QUESTION MARK TO WORK

Welding Rustless Steel

We have trouble spot welding rustless steel. Can you tell us of some company who is successful in this field?

S. V. R.

WE use an alloy which is low in carbon and contains about 18 per cent chromium and 8 per cent nickel in the manufacture of aircraft parts. We have succeeded in spot welding this alloy with considerable success. The trick is to use a quick accurately timed application of current. To accomplish this we use two switches, one for making contact and the other for breaking it and we use a separate contact some distance from the main contact to eliminate any tendency to burn or pit. Another item of importance in welding this material is the use of large electrodes and heavy current.

J. M. R.

Pickling Stove Plate

Can you suggest a good method for pickling stove plate for subsequent enameling?

S. T. C.

WE have found it satisfactory in the case of stove plate to immerse the parts in a weak solution of sulphuric acid in order to remove oxide and scale. We then follow this with a thorough washing and neutralizing with lime and hot water. Precaution must be taken to see that rusting does not occur after this washing. A quick drying with a hot blast usually prevents this until the parts reach the enameling room. Another danger to be avoided is the imprisoning of gas formed during pickling. Such imprisoned gas may be released after enameling with resultant imperfections. Thorough and repeated washings usually overcome this difficulty.

L. D. P.

Nitriding Valve Parts

Should parts which are to be nitrided be separated when packed in the nitriding box?

N. T.

PARTS that have flat sides that require uniform hardness should be separated. Round and irregular surfaces, such as pump shafts and valve parts, can be thrown in together in the nitriding box without harmful results. We are doing this with heats as large as 2000 lb. and are obtaining successful results in from 30 to 40 hours.

L. E. R.



NOW is the time to do some of those long deferred jobs. We have found that present conditions, if they accomplish nothing else, offer an opportunity for placing our house in order, for making repairs and giving the shop a general overhauling. In this way we are able to give employment to additional men and because of the extra equipment at our disposal we are able to do the repair work with relatively little interference with regular production schedules. Our object, of course, is to get set for carrying on normal business at lower production costs.

C. G. Schluederberg,
Works Manager,

Westinghouse Electric & Mfg. Co.,
Cleveland, Ohio.

▲ ▲ ▲

"IS a new sheet and tin plate mill being built in Buenos Aires?" "What pressure is required to bend steel plates of various thicknesses in a bending press?" "What is the cost of pickling steel sheets?" These are a few of the questions recently received for this feature. Some of the answers will appear in future issues. Wherever possible answers are sent direct and your question too will be answered either by letter or in this department if an answer can be located. Please address Forum Editor, Iron Age Publishing Co., 239 West 39th Street, New York.

▼ ▼ ▼

THIS feature appears bi-weekly and is offered as a clearing house for everyday problems of the metal-working industry. The answers as presented are not always indorsed by The Iron Age editors.

Riveting with Gunpowder

What is the gunpowder method of riveting?

R. S. V.

THE so-called Temple gun was developed to attach lugs or rivets to the sides of sunken steel vessels but more recently its use has been expanded to include emergency riveting beyond the reach of air lines. The principle of its operation is delayed action. This is usually secured by means of a break pin which restrains movement of the projectile until desired pressure has been built up. In recent experimental work a break pin has been designed to give the projectile an initial velocity of 5000 ft. per second. Studs which are shot by means of this gun through the plates of a sunken vessel develop a surprising resistance to removal. The flow of metal in the plate is not in the direction the projectile is going but at right angles to it. This creates a holding power frequently equal to the strength of the stud. The same principle has been used to join ends of steel cable.

J. B.

Weight of Heavy Rails

When is a rail a heavy rail? In other words where is the dividing line between heavy and light rails?

E. O. R.

THE dividing line between heavy rails and light rails naturally changes from time to time as the requirements of the railroads change. A light rail today may have been considered a heavy rail ten or fifteen years ago. Axle loads on the railroads continue to increase and this means that the weight of the standard trunk line rail must also increase. At the present time the dividing line probably comes at the 60-lb. rail. Rails weighing 60 lb. or more are classified as heavy rails.

* * *

A similar question might concern the dividing line between sheets and plates. In actual field practice this division comes at 7 gage or 3/16 in. plate. Anything thinner than this is designated as a sheet.

*A. I. S.

* This answer submitted by the American Institute of Steel Construction, Inc., New York.

What material is used in the small nickel-plated garment fasteners offered for sale in five and ten cents stores? These are described as rust proof.

P. E. M. CO.

The flat metal parts are made of brass and the spring is a special bronze wire. The fastener is produced at high speed on highly individualized automatic machines.

S. M. Co.

Facts and Opinions in the Metal-Working Industry

By JOHN H. VAN DEVENTER

Editor, The Iron Age

Payroll Positions and Immediate Expectations

PAYROLL shrinkages indicate what has happened both to consuming and producing power. As a guide to the position of the industry, these data are much more indicative than number of employed or unemployed, especially when a few hours per week may constitute employment. They indicate the triple shrinkage in number employed, hours worked and hourly rates.

The figures which follow indicate the percentage reduction in last current payroll period from the corresponding period in 1929. In other words, the figure 75 indicates that the present payroll is but 25 per cent of that of the same period three years ago.

The letters B or W indicate the immediate expectation for better or worse as expressed by the individual concerns. Where no letters follow the figures, trend expectations were not given.

The average of the 244 companies reporting payroll position shows a reduction of 61.5 per cent from 1929 levels.

Individual figures are shown so that the reader may note the range in various branches of the industry.

Figures show per cent reduction in current payrolls from corresponding period, 1929

Letters indicate immediate expectation, B—Better, W—Worse

Automotive, Boats, Aircraft

Automobile Bodies, 33B.

Automobile Parts, 12B, 25W, 25B, 60, 60B, 65B, 65B, 70W, 70, 70B, 75W, 81W, 90W.

Automobile Stampings & Forgings, 41W, 50B, 75W, 80W.

Boat and Aircraft Accessories, 10W, 50W.

Average payroll reductions—55.4 per cent
Immediate outlook, 8 Better, 10 Worse

Bolts, Nuts, Screw Products, Etc.

Bolts, Nuts, Screws, Rivets, 50W, 50W, 60, 60, 63B.

Screw Machine Products, 60W, 75W, 75W, 80B, 84W, 90W.

Tacks, Nails, Staples, 50B.

Average payroll reductions—66.4 per cent
Immediate outlook, 3 Better, 7 Worse

Castings

Car Wheels, etc., 45, 60B.

Gray Iron, 33W, 40B, 80B, 80W, 85B, 87W, 90.

Gray Iron & Steel, 27W, 72B.

Malleable, 61, 81.

Non-ferrous & Gray Iron, 10B, 70, 75W.

Non-ferrous, 25W, 70W.

Steel Castings, 50, 70, 80, 80, 89.

Average payroll reduction—63.5 per cent
Immediate outlook, 6 Better, 7 Worse

Chemicals and Refractories—30—40—50—90

Average payroll reductions—52.5 per cent
Immediate outlook, 0 Better, 0 Worse

Electrical and Construction

Electrical Appliances & Fittings, 70B, 70W, 75B.

Average payroll reduction—71.7 per cent
Immediate outlook, 2 Better, 1 Worse

Forgings

Drop Forgings, 15B, 80B, 80W, 84W, 80W.

Forgings, General, 72.

Average payroll reduction—68.5 per cent
Immediate outlook, 2 Better, 3 Worse

Heating Apparatus

Industrial Furnaces, 90.

Registers, Ventilators, 52B.

Stoves, Ranges, Furnaces, 50B, 50B, 56, 50B, 85W.

Average payroll reduction—61.9 per cent
Immediate outlook, 4 Better, 1 Worse

Household Goods and Equipment

Builders Hardware, 60W.

Cutlery & Table Ware, 40, 50B, 50, 51W, 60W.

Electric Refrigerators, 10B.

Lawn Mowers, 72.

Metal Beds & Springs, 30, 90W.

Oil Burners, 0B.

Plumbing Goods, 50.

Porcelain Enamel Ware, 50B.

Washing Machines, Firearms, 33.

Average payroll reduction—46.1 per cent
Immediate outlook, 4 Better, 4 Worse

Machine Elements

Gears, Wheels, etc., 30W, 75B.

Steel Balls (Bearing), 65B.

Average payroll reduction—56.7 per cent
Immediate outlook, 2 Better, 1 Worse

Machine Tools and Small Tools

Machine Tools, 40B, 58W, 66, 75W, 75, 77, 80B, 80W, 83, 85B, 90, 90W, 90B, 90W, 90W, 95, 95, 95B.

PRESENTED herewith, through the aid of chief executives in 277 metal-working plants of diversified type, are the results of a survey just completed by THE IRON AGE.

The resulting facts and opinions, fresh from a well-diversified cross-section of the industry, form what is probably the clearest picture yet shown of the pay-roll position of its various specialized branches and also the thinking of leading men of the industry with respect to important present-day questions.

Of interest to Reconstruction Finance authorities and committees studying the profitable extension of credit will be the uncovering, through this survey, of an indicated market in excess of twenty-five million dollars for plant modernization purposes.

The nature of the plants and companies from which replies were received is such that the results obtained may be taken as typical both of fact and opinion in the 4000 metal-working companies which in normal times reported an annual volume of \$500,000 or more.

Small Tools & Accessories, 33B, 55, 55B, 60, 63, 65W, 75, 80W, 84W, 92.

Average payroll reduction—75.6 per cent
Immediate outlook, 7 Better, 9 Worse

Materials Handling Equipment

Coal Handling Machinery, 90W.
Cranes, Hoists, Piling Machinery, 72, 75W, 80W, 95.
Dust Collecting & Conveying, 65.
Elevators & Conveyors, 35W, 57, 75B.
Industrial Cars, Mine Cars, 80B.

Average payroll reduction—72.4 per cent
Immediate outlook, 2 Better, 4 Worse

Miscellaneous Industrial Equipment

Agricultural & Dairy Tools, 45, 55, 60W, 66, 80, 64W.
Automatic Wrapping Machinery, 40B.
Bottling & Contract Machinery, 75W.
Foundry Equipment, 40W.
General Machine Building, 50W, 50B, 65B, 75B, 80.
Grain Handling Machinery, 15.
Hydraulic Machinery, 40W, 60W, 75W.
Industrial Ovens, 60.
Motion Picture Equipment, 60W.
Paper & Pulp Mill Machinery, 75W.
Printing Machinery, 40W.
Road Building Equipment, 25.
Steel Mill Equipment, 62W, 75.
Textile Machine Repair, 50B.
Textile Machinery, 75B.
Wireworking Machinery, 75.
Woodworking Machinery, 80W.

Average payroll reduction—59.0 per cent
Immediate outlook, 6 Better, 13 Worse

Power Plant and Pumping Equipment

Boilers, Engines, etc., 45, 75B.
Blowers, 70B.
Power Plant Supplies, 40W.
Pumps, 50, 66W, 75W.
Valves, Fittings, 70B.
Water Treating Apparatus, 50.

Average payroll reduction—60.0 per cent
Immediate outlook, 3 Better, 3 Worse

Sheet Metal Products, Stampings, etc.

Galvanized Ware, 54.
Light Stampings, 22, 65W.
Small Metal Products, 25W, 25, 30W, 50, 50B, 60B, 70, 75W, 90.

Average payroll reduction—51.3 per cent
Immediate outlook, 2 Better, 4 Worse

Sporting Goods, Bicycles, Etc.—50-B—80-W

Average payroll reductions 65.0 per cent
Immediate outlook, 1 Better, 1 Worse

Steel Production

Ingots, plates, shapes, sheets, 53, 64, 64, 68, 71, 74, 78.
Steel Tubing, 25B.
Steel Wire, 60W, 60W, 75W.
Steel & Iron Pipe, 66W.

Average payroll reduction—63 per cent
Immediate outlook, 1 Better, 4 Worse

Structural and Plate Fabrication

Sheet Fabrication, 30B, 30.
Steel Barrels, 65W.
Steel Plate Fabrication, 75B, 80, 80.
Structural, 33B, 50B, 50, 64, 80W, 90B, 90B, 90W.

Average payroll reduction—64.8 per cent
Immediate outlook, 6 Better, 3 Worse

Steel Office and Building Furniture

Office Furniture & Equipment, 40, 50, 70B.
Safes, Vaults, 40B, 65W.
Shelving, Lockers, Counters, 50W, Plus 100B*.

(* Business and Payroll Doubled)

Average payroll reductions—30.7 per cent
Immediate outlook, 3 Better, 2 Worse

Unclassed Metal Products and Machinery

Nature of Product Not Given, 0B, 30W, 33W, 33W, 45B, 50W, 50B, 60W, 60B, 65, 65B, 67B, 67, 68, 70, 75W, 75, 75, 75W, 78W, 80, 80, 80W, 80B, 80, 85, 85B, 90.

Average payroll reductions—64.5 per cent
Immediate outlook, 8 Better, 9 Worse

* * *

In addition to all of the sections above, nine replies failed to include payroll figures, but indicated immediate expectations as follows:

2 Better, 7 Worse

Credit Conditions and Modernization Possibilities

Credit Conditions and Loans

Out of a total of 246 concerns answering the question "Is your business hampered because of the refusal of banks to extend reasonable loans?", 89 replied "Yes" and 157 "No."

One hundred and forty-seven concerns, of the total of 246, reported that easier credit conditions would help them indirectly by helping their customers.

Modernization Possibilities

Seventy-nine concerns reported that the modernization of their plants would result in reducing manufacturing costs from 2 to 50 per cent, the average reduction being 15.3 per cent per reporting plant.

Fifty concerns reported that if they could secure funds for the purpose, they would make capital improvements
(Concluded on page 1366)

New Squaring Shear Combines Structural Steel and Cast Construction

SMOOTH and accurate operation and lighter reciprocating parts that are claimed to give longer life with lower operating cost are features of a new power squaring shear introduced by the Niagara Machine & Tool Works of Buffalo, N. Y.

This shear cuts $\frac{1}{4}$ -in. plates in 10-ft. lengths, and is available with 1-in. gap or 18-in. gap in the housings. It is of structural steel and cast construction. Housings and bed are semi-steel castings and the holddown, crosshead and transverse bar are of steel. The crosshead is of welded construction, consisting of a vertical member and a horizontal member tied together with triangular web sections for strength and rigidity. The heavy truss rod provides increased rigidity and provides a center adjustment. The crosshead is counterbalanced with large springs inclosed in cylinders; this facilitates functioning of the clutch and results in a more even application of power, which reduces the strain on wearing parts.

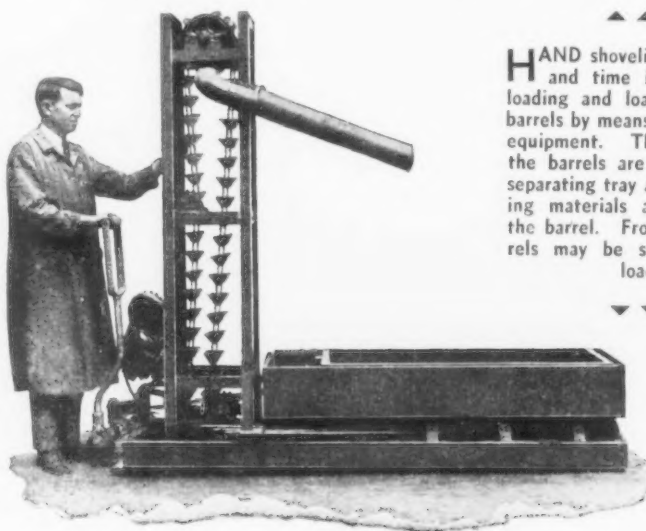
The shear is equipped with the company's individual spring foot hold-down, claimed to assure even pressure in spite of variation in the thickness of the metal being cut. It is possible to cut a $\frac{1}{4}$ -in. sheet and a $\frac{1}{16}$ -in. sheet simultaneously at opposite ends of the shear. Heavy and light sheets can be cut one immediately after the other, without making any adjustments. The holddown pressure is transmitted to the transverse bar, relieving the main shaft of this upward stress.

Main shaft has four bearings, two in the housings and two just outside the application of load, so that the load is applied to a short well supported section of the shaft. The gears or clutch wheel and pinion have hob generated teeth. Front, back, bevel and side gages are standard

equipment and a slitting gage is furnished on the 18-in. gap shear. The back gage is self measuring to $\frac{1}{64}$ in. and can be instantly locked in the desired position. Each end is adjustable independently.

"Speed-Loader" Facilitates Barrel Burnishing

USED in conjunction with a battery of burnishing barrels, the portable motor-driven equipment illustrated



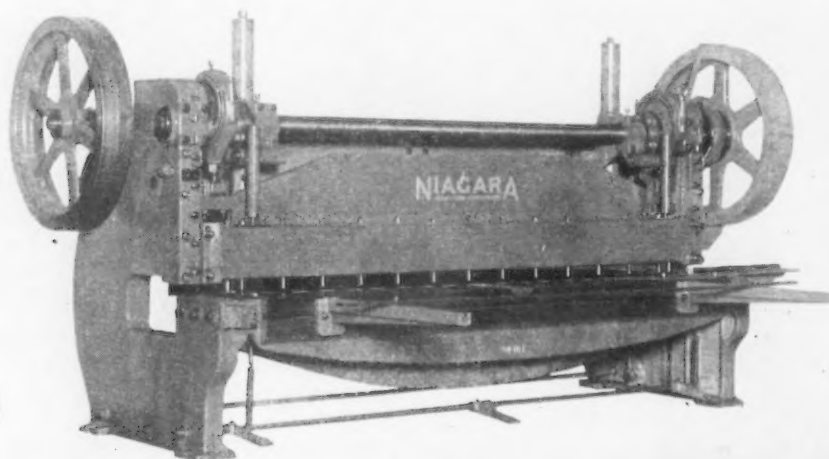
HAND shoveling is eliminated and time is saved in unloading and loading burnishing barrels by means of this portable equipment. The contents of the barrels are dumped into a separating tray and the burnishing materials are returned to the barrel. From 2 to 16 barrels may be serviced by this loader.

eliminates hand shoveling and waste of time in loading and unloading of the barrels.

This machine, designated as the Abbott Ball speed-loader, was designed by W. R. Hartley, materials handling engineer, New Haven, Conn., and is manufactured and marketed under license by the Abbott Ball Co., Hartford, Conn. It is an L-shaped

tronic motor drives the conveyor system through a speed reducer.

Lever operate four rustless steel gates in the bottom of the hopper. The design of these gates prevents overloading as the burnishing materials are admitted to non-corrosive malleable iron conveyor buckets that form a continuous belt (patent applied for), controlled by a rustless steel guide sheet underneath the hopper. The buckets carry the burnishing materials to the chute at the top of the tower, where they are discharged into the burnishing barrel. It is stated the machine will serve from two to 16 burnishing barrels, depending upon the nature of the work.



Rigidity of construction and lighter reciprocating parts are obtained by combining steel and cast members.

The Regorod welding rods and electrodes recently announced by the Bastian-Blessing Co., 240 East Ontario Street, Chicago, are described in a new 22-page catalog. The line includes gas welding rods, bare and flux coated electrodes, and cast-iron, bronze, tobin bronze and aluminum welding rods. Regite, an alloy of tungsten and molybdenum for hard surfacing, is also described, as well as fluxes, welding torches, hose and other Rego apparatus and supplies.

New Rotary Forging Furnace Has Water Seal

An interesting development in forging furnace construction is shown in the rotary furnace for oil or gas firing brought out by the Gas Machinery Co., Cleveland. In this furnace atmospheric control is maintained by a water seal which serves to prevent infiltration of air and by syphon vents in the side walls to carry away any water vapors.

The furnace has been designed to improve the quality of forgings by reducing to a minimum scale formation and surface decarburization,

thus to prolong die life and to allow the finishing of forgings to closer tolerances. It is found to allow for uniform temperature control with a low thermal head.

A water trough provides the water seal. Extending into this is the dam plate fitted on the outer circumference of the rotating hearth. The power consumed in the movement of the dam trough is of course inconsequential. Cooling water is circulated around the circular trough and any water vapors or infiltrated

air are discharged to the atmosphere with the waste gases from the furnace through circular flues and syphon vents in the side walls.

The water trough is partially covered by a heavy steel plate ring welded to the outer wall of the trough and supported from the floor of the trough by gusset plates. A ring made of cast iron segments with lugs cast on the under side rests upon the steel shelf formed by the steel plate ring and these form an annular flue extending the entire circumference of the furnace. The vents in the side walls extend downward to this flue. Waste gases leaving the furnace through the usual ports create a slight suction in the flue and draw up any water vapor or infiltrated air also into the flue. The vapor and air liberated from the water are thus disposed of without entering the heating chamber.

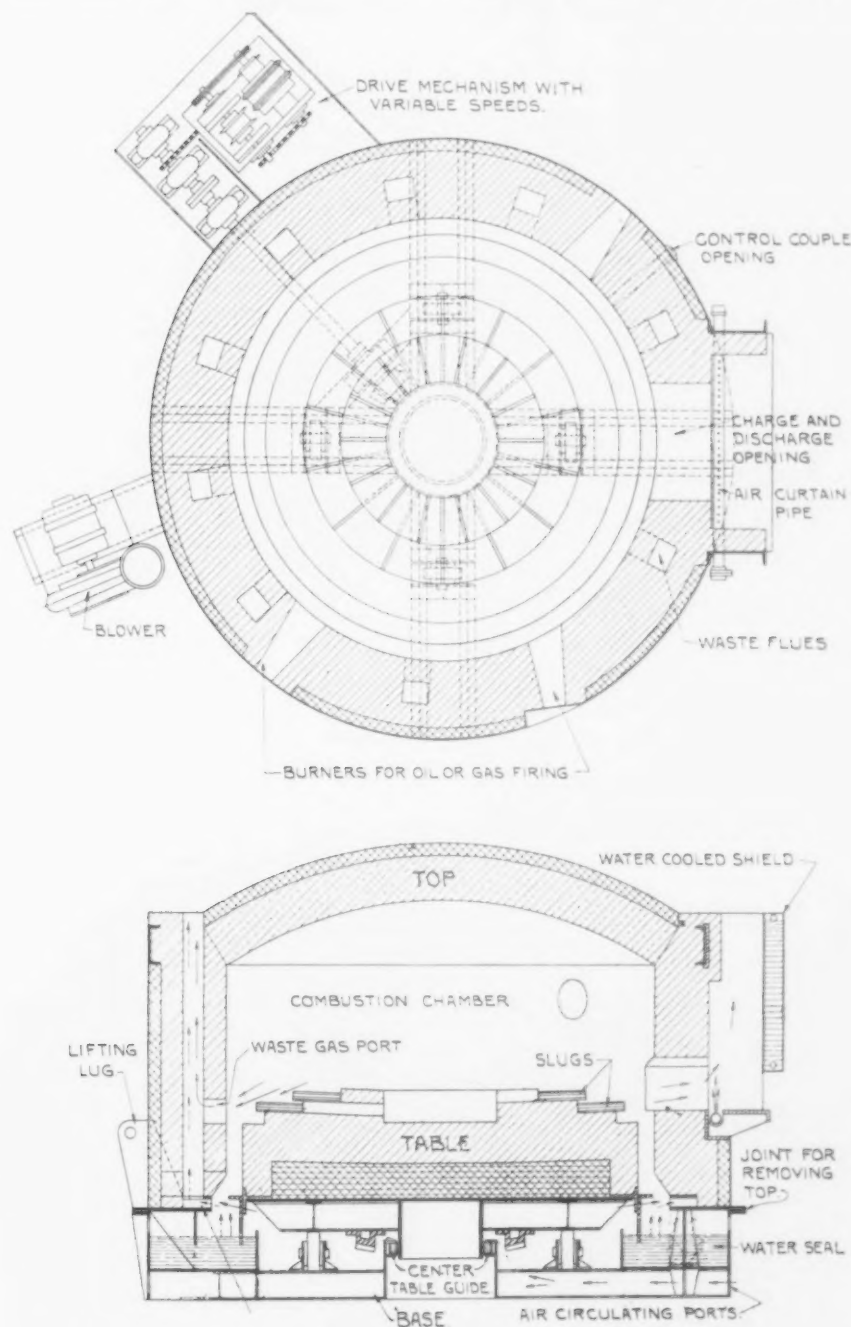
Research and plant operations have shown that the most economical operation of a forging furnace is attained when a neutral furnace atmosphere is maintained. Tests, it is stated, have proved that a furnace atmosphere containing from 0.5 to 1.5 per cent carbon monoxide and no oxygen should be maintained to insure heating the steel with a minimum of scale and surface decarburization, at the same time using a minimum of fuel. Burners in the new furnace are located sufficiently high above the stock to secure thorough combustion before the gases contact the stock. These products of combustion are found to constitute an effective protection against scaling and to supply the desired atmospheric conditions.

Work Close to Furnace Temperature

The work is placed directly upon the hearth, which is at furnace temperature. The under side of the piece is heated by conduction while the exposed side and top are heated by radiation. Thereby, it is pointed out, rapid and uniform heating and minimum internal strains are assured. The temperature of the heating chamber is maintained only slightly higher than that to which the stock is heated and this small temperature gradient between the stock and the furnace temperature under normal conditions serves also to eliminate the formation of slag.

The furnace has a single opening for charging and discharging stock, with all that this means for minimizing black body radiation losses and eliminating atmospheric drafts through the furnace. The one operator, who handles the product to and from the furnace, is protected from the heat at the charging opening by a water cooled shield and air curtain pipe.

Advantages claimed for the rotary forging furnace include its ability to heat pieces to a high temperature without danger that they will fuse



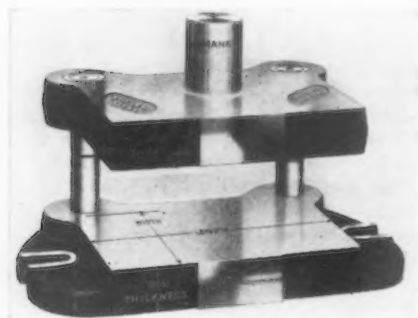
Furnace developed by the Gas Machinery Co. has water seal, arrangements for syphoning off directly vapor and any air liberated from the seal, and close control of furnace atmosphere with a low temperature gradient in the heating furnace.

and stick together, as they are placed on the revolving hearth with spacings between each piece. Also it is not necessary to feed dummies through to push out the stock at the end of the run. The circular construction of the heating chamber, it is pointed out, provides a minimum wall area resulting in low standby losses and high net thermal efficiency. The burners are located in the side wall of the furnace and the pieces on the rotating hearth pass through the hottest portion of the heating chamber just prior to reaching the discharge point. The flow of hot gases is counterwise to the direction of the table travel so that these gases are held in the heating chamber until a maximum amount of heat has been released.

The motive power for operating the table is for heavy duty service. Equipment includes full automatic temperature control. In the smaller sizes the top section of the furnace is removable from the flange connecting it to the cover of the water sealed trough. The furnaces are self contained units and do not require pits or special foundations. Patents are pending on this furnace.

Drop-Forged Steel Die Sets

E. A. BAUMBACH MFG. CO., 1218 E. South Kilbourn Avenue, Chicago, has placed on the market a new line of steel die sets, the die shoes and punch holders of which are drop forged from 0.35-0.40 per cent carbon steel which is completely normalized. Shanks are drop-forged as an in-



tegral part of the punch holder. Working surfaces are accurately machined and ground. Punch holders are fitted with bushings made of high content manganese steel, carbonized, hardened, ground and lapped to an individual fit on each hardened and ground leader pin of the corresponding die shoe.

General information in regard to the occurrence, production, properties and use of molybdenum is given in Economic Paper 15, by Alice V. Petar, just published by the United States Bureau of Mines.

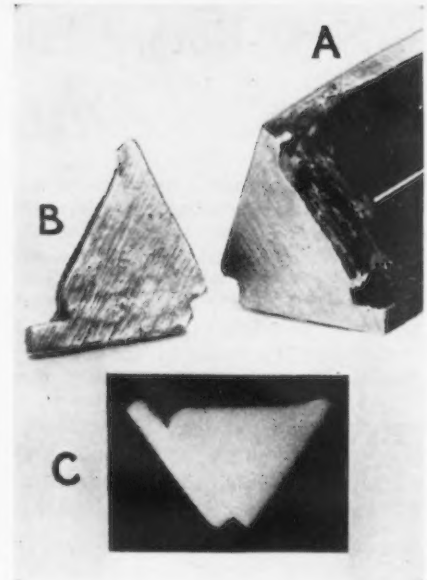
1354—The Iron Age, June 23, 1932

Offers Improved Welding Rod for 18-8 Rustless Steel

FOR use in welding Allegheny metal and other rustless steels of the 18-8 type, Joseph T. Ryerson & Son, Inc., Sixteenth and Rockwell Streets, Chicago, is marketing a new electrode. This rod is claimed to give uniformly satisfactory results, unusual performance being attributed chiefly to the special flux coating, which produces a non-active gas that surrounds the hot metal and prevents the formation of oxides. The heavy slag formed on top of the weld acts as a protective agent as the metal cools.

It is stated that when welding with this new electrode, it is unnecessary to remove the slag before the next bead is laid down. This enables the operator to work faster and at the same time secure better penetration. Tests are said to indicate carbon increase of about 0.01 per cent in the bead as compared with the original rod, the corrosion resistance of the deposited metal thus remaining equal to that of the parent metal, leaving the weld soft enough for machining.

The illustration shows a V-type fill of eight layers placed one on top of the other without removal of any slag. Piece A is the welded material



In addition to corrosion resistance and protection of the molten metal from the atmosphere, the new welding electrode permits faster work because slag does not have to be removed after each bead has been laid down. In the weld illustrated eight layers were deposited without removal of any slag.

from which section B, $\frac{1}{8}$ in. thick, was hack-saw cut across the weld. In C, an X-ray picture of B, it will be noticed that there are no blow holes, or gas or slag pockets.

Heat-Resisting Welding Hose

WELDING hose developed to meet the demand for material with unusual resistance to burst when subjected to contact with molten steel has been placed on the market by the B. F. Goodrich Rubber Co., Akron, Ohio. Submitted to 90-lb. internal air pressure, laid on crushed limestone foundation and covered with molten metal from an open-hearth furnace at a temperature of 2000 deg. F., the hose is said to have lasted for 1½ min., a much longer time than it would be subjected to in actual service. In another test, consisting of submitting the hose without internal pressure to the discharge from a burning or cutting tip for a period of 2 min., the hose is said to have survived in unusually good condition.

The rubber in this "Fire King" welding hose is especially compounded for heat resistance. The inner plies are wrapped fabric and the outside ply consists of braided asbestos yarn. The rubber cover is $\frac{3}{32}$ -in. thick.



The hose is stocked in $\frac{1}{4}$, $\frac{5}{16}$ and $\frac{3}{8}$ -in. sizes, 50-ft. lengths, and in both red and green colors.

4½-Inch Diameter Magnetic Clutch

MEASURING only 4½ in. in diameter, the multiple-disk magnetic clutch illustrated is thought



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C. G. Schluederberg,
Works Manager,

Westinghouse Electric & Mfg. Co.,
Cleveland, Ohio.

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"IS a new sheet and tin plate mill being built in Buenos Aires?" "What pressure is required to bend steel plates of various thicknesses in a bending press?" "What is the cost of pickling steel sheets?" These are a few of the questions recently received for this feature. Some of the answers will appear in future issues. Wherever possible answers are sent direct and your question too will be answered either by letter or in this department if an answer can be located. Please address Forum Editor, Iron Age Publishing Co., 239 West 39th Street, New York.

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THIS feature appears bi-weekly and is offered as a clearing house for everyday problems of the metal-working industry. The answers as presented are not always indorsed by The Iron Age editors.

Riveting with Gunpowder

What is the gunpowder method of riveting?

R. S. V.

THE so-called Temple gun was developed to attach lugs or rivets to the sides of sunken steel vessels but more recently its use has been expanded to include emergency riveting beyond the reach of air lines. The principle of its operation is delayed action. This is usually secured by means of a break pin which restrains movement of the projectile until desired pressure has been built up. In recent experimental work a break pin has been designed to give the projectile an initial velocity of 5000 ft. per second. Studs which are shot by means of this gun through the plates of a sunken vessel develop a surprising resistance to removal. The flow of metal in the plate is not in the direction the projectile is going but at right angles to it. This creates a holding power frequently equal to the strength of the stud. The same principle has been used to join ends of steel cable.

J. B.

Weight of Heavy Rails

When is a rail a heavy rail? In other words where is the dividing line between heavy and light rails?

E. O. R.

THE dividing line between heavy rails and light rails naturally changes from time to time as the requirements of the railroads change. A light rail today may have been considered a heavy rail ten or fifteen years ago. Axle loads on the railroads continue to increase and this means that the weight of the standard trunk line rail must also increase. At the present time the dividing line probably comes at the 60-lb. rail. Rails weighing 60 lb. or more are classified as heavy rails.

* * *

A similar question might concern the dividing line between sheets and plates. In actual field practice this division comes at 7 gage or 3/16 in. plate. Anything thinner than this is designated as a sheet.

*A. I. S.

* This answer submitted by the American Institute of Steel Construction, Inc., New York.

What material is used in the small nickel-plated garment fasteners offered for sale in five and ten cents stores? These are described as rust proof.

P. E. M. CO.

The flat metal parts are made of brass and the spring is a special bronze wire. The fastener is produced at high speed on highly individualized automatic machines.

S. M. Co.

The Iron Age, June 23, 1932—1355

Facts and Opinions in the Metal-Working Industry

By JOHN H. VAN DEVENTER
Editor, The Iron Age

Payroll Positions and Immediate Expectations

PAYROLL shrinkages indicate what has happened both to consuming and producing power. As a guide to the position of the industry, these data are much more indicative than number of employed or unemployed, especially when a few hours per week may constitute employment. They indicate the triple shrinkage in number employed, hours worked and hourly rates.

The figures which follow indicate the percentage reduction in last current payroll period from the corresponding period in 1929. In other words, the figure 75 indicates that the present payroll is but 25 per cent of that of the same period three years ago.

The letters B or W indicate the immediate expectation for better or worse as expressed by the individual concerns. Where no letters follow the figures, trend expectations were not given.

The average of the 244 companies reporting payroll position shows a reduction of 61.5 per cent from 1929 levels.

Individual figures are shown so that the reader may note the range in various branches of the industry.

Figures show per cent reduction in current payrolls from corresponding period, 1929

Letters indicate immediate expectation, B—Better, W—Worse

Automotive, Boats, Aircraft

Automobile Bodies, 33B.

Automobile Parts, 12B, 25W, 25B, 60, 60B, 65B, 65B, 70W, 70, 70B, 75W, 81W, 90W.

Automobile Stampings & Forgings, 41W, 50B, 75W, 80W.

Boat and Aircraft Accessories, 10W, 50W.

Average payroll reductions—55.4 per cent
Immediate outlook, 8 Better, 10 Worse

Bolts, Nuts, Screw Products, Etc.

Bolts, Nuts, Screws, Rivets, 50W, 50W, 60, 60, 63B.

Screw Machine Products, 60W, 75W, 75W, 80B, 84W, 90W.

Tacks, Nails, Staples, 50B.

Average payroll reductions—66.4 per cent
Immediate outlook, 3 Better, 7 Worse

Castings

Car Wheels, etc., 45, 60B.

Gray Iron, 33W, 40B, 80B, 80W, 85B, 87W, 90.

Gray Iron & Steel, 27W, 72B.

Malleable, 61, 81.

Non-ferrous & Gray Iron, 10B, 70, 75W.

Non-ferrous, 25W, 70W.

Steel Castings, 50, 70, 80, 80, 89.

Average payroll reduction—63.5 per cent
Immediate outlook, 6 Better, 7 Worse

Chemicals and Refractories—30—40—50—90

Average payroll reductions—52.5 per cent
Immediate outlook, 0 Better, 0 Worse

Electrical and Construction

Electrical Appliances & Fittings, 70B, 70W, 75B.

Average payroll reduction—71.7 per cent
Immediate outlook, 2 Better, 1 Worse

Forgings

Drop Forgings, 15B, 80B, 80W, 84W, 80W.

Forgings, General, 72.

Average payroll reduction—68.5 per cent
Immediate outlook, 2 Better, 3 Worse

Heating Apparatus

Industrial Furnaces, 90.

Registers, Ventilators, 52B.

Stoves, Ranges, Furnaces, 50B, 50B, 56, 50B, 85W.

Average payroll reduction—61.9 per cent
Immediate outlook, 4 Better, 1 Worse

Household Goods and Equipment

Builders Hardware, 60W.

Cutlery & Table Ware, 40, 50B, 50, 51W, 60W.

Electric Refrigerators, 10B.

Lawn Mowers, 72.

Metal Beds & Springs, 30, 90W.

Oil Burners, 0B.

Plumbing Goods, 50.

Porcelain Enamel Ware, 50B.

Washing Machines, Firearms, 33.

Average payroll reduction—46.1 per cent
Immediate outlook, 4 Better, 4 Worse

Machine Elements

Gears, Wheels, etc., 30W, 75B.

Steel Balls (Bearing), 65B.

Average payroll reduction—56.7 per cent
Immediate outlook, 2 Better, 1 Worse

Machine Tools and Small Tools

Machine Tools, 40B, 58W, 66, 75W, 75, 77, 80B, 80W, 83, 85B, 90, 90W, 90B, 90W, 90W, 95, 95, 95B.

PRESENTED herewith, through the aid of chief executives in 277 metal-working plants of diversified type, are the results of a survey just completed by THE IRON AGE.

The resulting facts and opinions, fresh from a well-diversified cross-section of the industry, form what is probably the clearest picture yet shown of the pay-roll position of its various specialized branches and also the thinking of leading men of the industry with respect to important present-day questions.

Of interest to Reconstruction Finance authorities and committees studying the profitable extension of credit will be the uncovering, through this survey, of an indicated market in excess of twenty-five million dollars for plant modernization purposes.

The nature of the plants and companies from which replies were received is such that the results obtained may be taken as typical both of fact and opinion in the 4000 metal-working companies which in normal times reported an annual volume of \$500,000 or more.

Small Tools & Accessories, 33B, 55, 55B, 60, 63, 65W, 75, 80W, 84W, 92.

Average payroll reduction—75.6 per cent
Immediate outlook, 7 Better, 9 Worse

Materials Handling Equipment

Coal Handling Machinery, 90W.
Cranes, Hoists, Piling Machinery, 72, 75W, 80W, 95.
Dust Collecting & Conveying, 65.
Elevators & Conveyors, 35W, 57, 75B.
Industrial Cars, Mine Cars, 80B.

Average payroll reduction—72.4 per cent
Immediate outlook, 2 Better, 4 Worse

Miscellaneous Industrial Equipment

Agricultural & Dairy Tools, 45, 55, 60W, 66, 80, 64W.
Automatic Wrapping Machinery, 40B.
Bottling & Contract Machinery, 75W.
Foundry Equipment, 40W.
General Machine Building, 50W, 50B, 65B, 75B, 80.
Grain Handling Machinery, 15.
Hydraulic Machinery, 40W, 60W, 75W.
Industrial Ovens, 60.
Motion Picture Equipment, 60W.
Paper & Pulp Mill Machinery, 75W.
Printing Machinery, 40W.
Road Building Equipment, 25.
Steel Mill Equipment, 62W, 75.
Textile Machine Repair, 50B.
Textile Machinery, 75B.
Wireworking Machinery, 75.
Woodworking Machinery, 80W.

Average payroll reduction—59.0 per cent
Immediate outlook, 6 Better, 13 Worse

Power Plant and Pumping Equipment

Boilers, Engines, etc., 45, 75B.
Blowers, 70B.
Power Plant Supplies, 40W.
Pumps, 50, 66W, 75W.
Valves, Fittings, 70B.
Water Treating Apparatus, 50.

Average payroll reduction—60.0 per cent
Immediate outlook, 3 Better, 3 Worse

Sheet Metal Products, Stampings, etc.

Galvanized Ware, 54.
Light Stampings, 22, 65W.
Small Metal Products, 25W, 25, 30W, 50, 50B, 60B, 70, 75W, 90.

Average payroll reduction—51.3 per cent
Immediate outlook, 2 Better, 4 Worse

Sporting Goods, Bicycles, Etc.—50-B—80-W

Average payroll reductions 65.0 per cent
Immediate outlook, 1 Better, 1 Worse

Steel Production

Ingots, plates, shapes, sheets, 53, 64, 64, 68, 71, 74, 78.
Steel Tubing, 25B.
Steel Wire, 60W, 60W, 75W.
Steel & Iron Pipe, 66W.

Average payroll reduction—63 per cent
Immediate outlook, 1 Better, 4 Worse

Structural and Plate Fabrication

Sheet Fabrication, 30B, 30.
Steel Barrels, 65W.
Steel Plate Fabrication, 75B, 80, 80.
Structural, 33B, 50B, 50, 64, 80W, 90B, 90B, 90W.

Average payroll reduction—64.8 per cent
Immediate outlook, 6 Better, 3 Worse

Steel Office and Building Furniture

Office Furniture & Equipment, 40, 50, 70B.
Safes, Vaults, 40B, 65W.
Shelving, Lockers, Counters, 50W, Plus 100B*.

(* Business and Payroll Doubled)

Average payroll reductions—30.7 per cent
Immediate outlook, 3 Better, 2 Worse

Unclassed Metal Products and Machinery

Nature of Product Not Given, 0B, 30W, 33W, 33W, 45B, 50W, 50B, 60W, 60B, 65, 65B, 67B, 67, 68, 70, 75W, 75, 75, 75W, 78W, 80, 80, 80, 80W, 80B, 80, 85, 85B, 90.

Average payroll reductions—64.5 per cent
Immediate outlook, 8 Better, 9 Worse

* * *

In addition to all of the sections above, nine replies failed to include payroll figures, but indicated immediate expectations as follows:

2 Better, 7 Worse

Credit Conditions and Modernization Possibilities

Credit Conditions and Loans

Out of a total of 246 concerns answering the question "Is your business hampered because of the refusal of banks to extend reasonable loans?", 89 replied "Yes" and 157 "No."

One hundred and forty-seven concerns, of the total of 246, reported that easier credit conditions would help them indirectly by helping their customers.

Modernization Possibilities

Seventy-nine concerns reported that the modernization of their plants would result in reducing manufacturing costs from 2 to 50 per cent, the average reduction being 15.3 per cent per reporting plant.

Fifty concerns reported that if they could secure funds for the purpose, they would make capital improvements

(Concluded on page 1366)

The Iron Age, June 23, 1932—1357

Attacks on Steel Prices Unwarranted

By C. E. WRIGHT

Markets and News Editor, The Iron Age

WITH the characteristic presumption which too often marks the efforts of economic and statistical organizations to appraise business conditions, the Alexander Hamilton Institute has issued a bulletin on "Steel Prices" which should not be permitted to pass unnoticed. Unfortunately, such statistical analyses fall into the hands of many people who do not have the means of obtaining the underlying facts, and they are influenced to believe that the conclusions stated are correct because no one with the knowledge and authority to speak takes the trouble to deny them.

Price Cuts Did Not Turn Tide in 1921

In the very first sentence of its bulletin the Alexander Hamilton Institute displays an ignorance of the conditions which brought us out of the 1921 depression:

"The depression which the steel industry experienced in 1921 was solved in relatively short order by a drastic reduction in steel prices. . . . These bargain prices started a buying movement which eventually led to a record high production."

As a matter of fact, the lowest steel prices of that depression period developed after the beginning of an upturn in business volume. Recovery from the depression, as reflected by steel production, had started some months before prices reached their lowest point. The upward trend in steel ingot output began in August, 1921, and continued with only a slight check in December until the middle of the following year. The average steel price level in August, 1921, was almost \$7 a ton above the low point reached in February, 1922, and, incidentally, that August average was about \$5 a ton below today's average, as shown by THE IRON AGE composite price.

Price, however, was not the important element in the recovery of 1922. There had been built up through the World War period a tremendous housing shortage; the railroads, returned to their owners by the Government, had need of almost complete rehabilitation and ordered the largest volume of equipment in any year in recent history; millions of people with war profits or savings in the form of Liberty bonds, were able to satisfy their longing for an automobile, and motor car output in 1922 for the first time

passed 2,500,000 units. None of these large reservoirs of steel demand exists today; if they did exist, lack of credit or purchasing power would prevent their immediate fulfillment.

Prices Not a Dominant Factor in Major Consuming Industries

For many years building construction, the railroads and the automobile industry combined have taken from 48 to 55 per cent or more of all of the finished steel. No major improvement in steel business can occur until one or more of these three major branches of consumption is able to resume operations on a more substantial scale. Although the average market price of ten leading building materials, including steel, is today represented by the figure 150 as compared with a base of 100 for 1914, anyone familiar with the conditions knows that material costs are not a retarding factor at present in the failure of building construction to revive; a surplus of rentable space and financial difficulties are the obstacles to be overcome. Bid prices on fabricated structural material, which are the real guide to the cost of most of the steel used for large buildings rather than the price of the plain material, are in many instances down to pre-war levels, despite higher labor and transportation costs. Most of the railroads are virtually broke and are buying nothing beyond their most essential needs. It is doubtful whether there would be much buying of rails and rolling stock if steel prices were considerably lower; a reduction of \$5 a ton on steel would mean a difference of only \$50 to \$75 on a freight car, which probably wouldn't stimulate the purchase of a single car, considering that railroads have a surplus of equipment for present-day traffic. The automobile industry is already giving so much value for the dollar that even substantially lower steel prices would not affect motor car selling prices, but would merely put the steel industry in the position of absorbing some of the automobile companies' probable losses.

Therefore, when the Alexander Hamilton Institute states that "The steel industry during the current depression has not only failed to quote the bargain prices needed to stimulate a revival of the demand, but it has kept steel beyond the means of consumers," and then goes on further to say that "It is evident that, barring

an artificial inflation of the currency, a revival of steel buying will not occur until steel prices are further reduced," it is stating what buyers or sellers of steel could easily refute.

"On the basis of the present level of all commodity prices, steel prices should be 23.5 per cent lower than at the present time to be within the means of consumers," the bulletin further states.

This is merely a repetition of the too-frequent assertions of the extreme deflationists that all prices should be reduced to a common level. Such statements completely ignore the fact that steel prices had no such inflation in 1929 as did copper, for example; in fact, the average level of steel prices in 1929 was only \$3.46 a ton above the average of 1922 and was \$2.78 below the average of 1921. Moreover, the present average, as shown by THE IRON AGE composite price, is \$6.50 below the peak of 1929, and this difference does not take into consideration the fact that some grades of sheet steel have declined from \$20 to \$40 a ton in recent years. These are grades not fully reflected in most of the composite steel prices commonly referred to, nor is there coverage of hot-rolled strip steel, a big item with the automobile companies, which is selling at a third of its price just at the close of the war, when it was first introduced on an important scale.

Moreover, when the assertion is made that steel prices have declined only 13.5 per cent from the 1929 level while all commodities have dropped 32.1 per cent during the same period, there is complete ignoring of the fact that the general commodity price level includes many raw materials and farm products, which, through forced liquidation of large surpluses, have gone to all-time low records and far below cost of production. Steel is virtually made to order and such surpluses do not accumulate to be thrown on the market at any prices they will bring.

Huge Losses Ignored, Subsistence Wages Disregarded

The Alexander Hamilton Institute concludes with the naive statement that

"The steel industry is still burdened with too high labor costs to permit the needed reduction in prices despite the substantial lowering of wage

scales," and suggests that "the industry must consequently either abandon its present policy and reduce employment or it must make a further drastic slash in wage rates."

This specious argument seems to take no account of the staggering losses of nearly all steel companies despite the most drastic economies, losses that if not soon checked will bring some of them close to the brink of financial disaster; it takes no account of the fact that tens of thou-

sands of steel mill workers are subsisting on a "bread and water" diet or that most of them would be thrown upon public charity if the steel industry, to an extent greater than most industries, had not rotated work with a view to the humane elements of the situation, regardless of the added cost on this account.

As to the tremendous burden of inescapable costs from which the steel industry is suffering by reason of its efforts to keep running under the

worst conditions it has ever experienced, the explanation will be found in the succeeding article, which analyzes present cost factors in steel production as compared with those of pre-war.

The steel industry, in the supreme effort it is making to preserve some semblance of employment for hundreds of thousands, deserves the commendation of all sound-thinking people and not the criticism of those who "know not whereof they speak."

Today's High Cost of Making Steel

By W. W. MACON

Consulting Editor, The Iron Age

PRICES of steel are roughly one-third more today than they were in 1915, while the costs of making the steel are nearly double. Such is the showing of the records of one of our large steel companies making several forms of finished steel. The fact ought to serve as an answer to the deflationist school of economists

of, say, 1915. Sometimes their contention is that steel should have declined from its high of 1929 to the extent that commodities in general have. They claim that buying is held back because there has not been a sharper drop.

That losses are being shown in the operations of both the big and little

companies seems to mean nothing in the face of abstract ratios. That a general commodity average includes commodities that have reached record low levels (partly as a result of revolutionary manufacturing processes), and therefore there are many high-level commodities which balance the low-level ones, seems likewise not to be taken into account. Apparently if 20 things have registered a given decline, the twenty-first must fall to the same degree. Then if the statistical observers on the side lines succeed by propaganda or otherwise in deflating the twenty-first, they would go after the twenty-second, and so on. The calculators stand by the brute figures, whether or no. Abstract determinations, one concludes from their pronouncements, must be respected, no matter what the conditions are in the industry itself.

Meanwhile those most vitally interested, the buyers, are not clamoring for price cutting. Neither they nor the producers can discern wherein an expansion in sales can be effected through the medium of price cutting. Rather do they, especially the larger ones, profess to find in the eradication of weakness the basis of an upturn in activity. They desire stabilization in the prices of the products into which steel enters. When continued weakness prevails in steel, the weakness extends into the second and succeeding lines of manufacture.

Labor and Overhead Are Big Items in Steel Cost

The table accompanying the chart shows what a large item the labor cost today is. Even with the 15 per cent wage cut put into effect in the middle of the current quarter and not reflected in the tabulation, the labor item still would be, other things remaining substantially unchanged, \$13.50 a ton, and the total cost \$41.30. Labor would still represent 35 per cent of the total cost, and the

(Concluded on page 1380)

COST OF FINISHED STEEL

	1915		FIRST QUARTER 1932		Ratio of Increase
	Per Gross Ton	Per Cent of Total	Per Gross Ton	Per Cent of Total	
Material	\$7.65	36.1	\$11.70	26.8	1.53
Fuel	1.85	8.7	5.20	11.9	2.81
Transportation	4.70	22.2	7.10	16.2	1.51
Labor	5.45	25.7	15.90	36.4	2.92
Other	1.55	7.3	3.80	8.7	2.45
Total	\$21.20	100.	\$43.70	100.	2.06

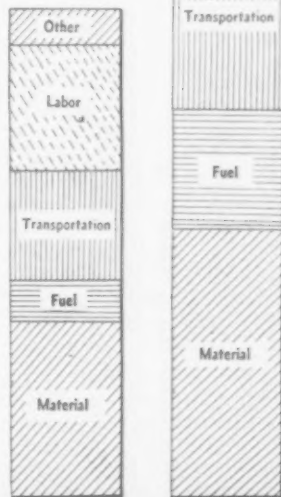
who are insistent that steel prices give way and do so by as much as \$8 to \$10 a ton.

The accompanying diagram tells the story of the difference in conditions in the first three months of 1932 and in 1915. The amounts given for the several divisions of cost are not actual, but the relatives are precise. For example, the cost of a ton of finished steel in the first quarter of this year averaged actually 2.06 times that of 1915. Yet the prices obtained were of the order of 2.13c. in 1932, averaged for the several forms of steel, and 1.52c. in 1915, an increase of 40 per cent against more than double the base cost. THE IRON AGE composite prices, which are broader in scope because they cover more forms of steel than manufactured by the company under consideration, are 2.044c. and 1.534c. for the two periods, the one 33 per cent more than the other.

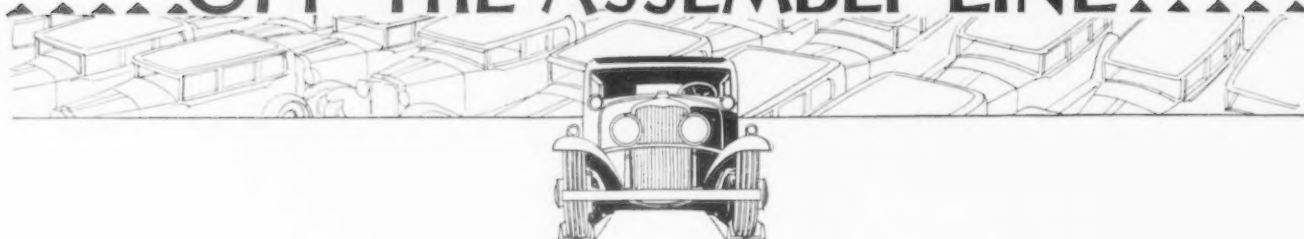
The argument of the statistically-minded analysts is that steel prices should be close to a parity with those

COMPARATIVE COSTS

Left-hand column, 1915
Right-hand column, first quarter of 1932



OFF THE ASSEMBLY LINE



Ford's Production Is Being Maintained, While Other Motor Companies Face Lean Summer

DETROIT, June 20.

ASIDE from the Ford Motor Co., which is maintaining production at about 5000 cars a day equally divided between fours and eights, the automobile industry continues to tighten its belt in anticipation of a lean summer. Output is tapering further, both in the medium and low-price fields; manufacturing activities in the quality group already are at an almost irreducible minimum. In the face of the depressing immediate outlook, individual companies are bending their energies mainly toward development of new models. It is safe to say, however, that even the managements of these concerns do not know when the new products will be offered. The dates will depend upon political and economic happenings in the next two months.

Even with the prospect that changes may be made earlier than usual this year, it would be a mistake for equipment makers to expect much business from the tooling up process. This is especially true of companies above the lowest price group. All of them have more machine tools than they can use and it will be natural for them to put these tools into service before they contemplate new equipment purchases. One important medium-price car maker is reputed to have 1200 machine tools retired from active production, but available for manufacturing purposes. While it is reasonable to assume that a considerable proportion of these tools might be defined as obsolete, it is obvious that this company, with such a substantial equipment inventory, will draw on its own supply first. This is a typical example of conditions throughout the industry. In their frugality in the purchase of new machine tools, factory executives will be guided also by the desire to conserve finances and by the fact that mechanical changes are likely to be slight.

It is in the special equipment field that machine tool builders will find their principal hope. The case of the Ford Motor Co. is an example. Ford

Ford's production of 5000 cars a day is about equally divided between eights and fours.

* * *

Machine tool purchases for tooling up new models this fall are likely to be poor. Ford will be chief equipment buyer.

* * *

Industry's output this month should be 200,000 units or more.

▼ ▼ ▼

is interested in cutting further the production costs on its new cars, especially in the machining of motor parts. It has purchased a large amount of special-purpose equipment and will continue in the market indefinitely for the same kind of tools. In most cases each tool bought will perform a number of operations, replacing several machines formerly employed for the work. Carrying out this cost reducing program, Ford will be the chief reliance of the machine tool trade for business in this district during the summer months.

Ford has given some steel releases the past week and may buy strip steel and sheets some time this week. Its operations at Rouge finally have reached the point where the proportion of fours and eights is evenly balanced. Its output this month should be fairly close to its goal of 112,000 units and it is understood that approximately the same schedule will be carried over through July. Unless unforeseen difficulties are encountered, the present production rate will be sustained all summer. This is particularly gratifying in view of the fact that Ford's expenditures for materials and parts are the most widespread in the industry. Briggs and Murray are reported to have had hold-ups on Ford bodies and frames respectively the past week, but these were temporary and due to the balancing up of Ford stocks at branch assem-

bly plants. Ford's large supply of steel bars at Rouge, turned out in its own steel plant, has prevented steel mills from obtaining considerably larger bookings from the Ford company.

Chevrolet Output Declining

Chevrolet assemblies are declining, but may reach 40,000 cars this month. A few plants, especially General Motors Truck at Pontiac, had a mild spurt the last 10 days getting out several large orders prior to June 21, when the Federal automobile sales tax becomes effective. Auburn reports 1800 unfilled orders on hand and additional orders coming in at the rate of 170 a day as the result of its recent drastic price cuts. Production at Connersville is now averaging 100 units a day and at Auburn 40. Lycoming Mfg. Co., division of the Cord Corp., will make 3000 Auburn motors this month. Willys-Overland is working on new models, one of which is said to be for competition in the light car field, but it has not been decided when they will be put on the market. The Chrysler people are figuring on a new low-price car, but are said to have not yet determined which division will sponsor it.

Indicative of the times is the policy of one well-known manufacturer which does not produce a car, unless it has a bona fide order from a dealer, although it has several lines in more than one price class. In fact, this company inaugurated this policy almost two years ago. It is an expensive method of operating a large plant, but on account of the depression it is believed that the company has lost less money by adhering to this method than if it had turned out cars in considerable volume for a short period and then shut down until sales caught up with production. Still another automobile maker is going a step further. It not only requires an order from a dealer prior to assembly of a car, but also reserves the privilege of determining whether the dealer, even though he has cash in hand, is justified in the purchase.

Railroad Debt Burden Restricts Purchases of Supplies and Materials

By DR. LIONEL D. EDIE

IN 1929 the railroads consumed approximately \$1,715,000,000 worth of supplies. In 1932 their purchases will scarcely exceed \$500,000,000. This sharp decline in purchases hits especially such commodities as coal, fuel oil, steel and lumber, where railroad demand alone normally takes about one-fifth of the country's output of such materials.

A slump of about 70 per cent in railroad buying is a heavy blow to the steel industry and to other important purchasers of materials.

How Railroads Curtail National Income

Not only are the railroads of major importance as buyers of materials, but also they are a primary source of the national income received by individuals. They are a source of a stream of buying power flowing into the hands of laborers and security owners. The following estimates approximate the changes in this respect during the past three years:

Railroads as Source of National Income		
	1929	1932
Wages and salaries	\$3,110,000,000	\$1,698,000,000
Interest paid out	556,000,000	530,000,000
Dividends paid out	346,000,000	63,000,000
Total	\$4,012,000,000	\$2,291,000,000

These figures are in part based upon estimates, but they are probably not greatly in error. They show striking declines in payroll and dividend rates. Moreover, they show a total contribution to national income cut down in 1932 to only a little better than half the 1929 level.

Interest paid out excludes intercorporate payments within the railroad industry itself, but includes payments to life insurance companies, savings banks and other institutional owners of railroad bonds. This figure is relatively stable, reflecting the fixed-charge character of the interest item.

Outlay in all other directions has had to be pared to the bone in order to do everything possible to keep up interest on railroad debt. Demand for materials has been cut sharply. Contribution to the income of the country has been cut sharply. Fixed charges have exacted retrenchment in all other directions.

The total financing problem of the roads arises not only from a deficit

on fixed charges, but also from two other primary sources, namely, maturities on bonds and notes and refinancing of bank loans. The following estimates afford an approximate picture of these three types of requirements in 1932:

Financing Requirements in 1932 (Estimated)	
Maturities	\$276,000,000
Bank loans	273,000,000
Deficit on fixed charges	200,000,000
Total	\$749,000,000

Of this total, perhaps \$50,000,000 can be provided by loans from the Railroad Credit Pool, deriving income from the grant of increased freight rates. Probably about \$400,000,000 will be taken care of by the Reconstruction Finance Corporation, leaving the balance to be provided from private sources. The total financing problem of the railroads is around three-quarters of a billion dollars at a time when the private bond market offers practically a closed door.

In 1933, maturities will run about \$57,000,000 heavier than in 1932. Unless traffic volume picks up, the total financing requirement next year will presumably run fully as large as this year.

In the meantime, deferred maintenance is becoming a serious problem and it seems inevitable that most roads will soon be forced to devote more outlay to this purpose than at present in order to preserve property and insure safety of operation.

The Amount of Railroad Bonds and Notes

The outstanding bonds and notes of the railroads amount to about \$13,081,000,000, of which \$654,000,000 is short-term notes. In 1913 the total of bonds and notes was \$10,842,000,000.

Obviously, the growth of debt during the past 19 years has been moderate. No one can accuse the railroads of having indulged in a wild orgy of debt expansion during the war and post-war period. Their present debt problem cannot be traced to prior over-expansion of debt during the "new era" period.

Rather, their debt problem is traceable to a violent contraction of income in an industry of heavy fixed capital charges and of relatively inflexible tax and wage rates. Physical

volume of traffic has slumped to less than half the pre-depression level, but debt charges are unabated, taxes practically so, and wage rates down roughly 10 per cent.

This condition would not be so serious were it not for the fact that the public has come to feel that the railroad industry has passed its crest of growth. It no longer is the dynamic industry that it was in the twenties. Growth has pretty largely gone out of the industry. This feeling gravely influences investors in their attitude toward many railroad securities and largely accounts for the fact that the current market value of the railroad funded debt is only about \$6,000,000,000, or about one-half of par value.

Scaling Down of Capital Structure

The scaling down of capital structures has already been brought to a focus by the Wabash receivership and by the plans for voluntary reorganization of the Cotton Belt and the Frisco line. There are some observers who believe a series of receiverships lie ahead, and certainly it must be admitted that market prices of the bonds of a third or more of the roads appear to be at such low levels as to anticipate receivership.

But those who advocate letting wholesale receiverships occur apparently overlook the serious consequences for life insurance companies, savings banks and other institutions which are heavy holders of railroad bonds and notes. Data are incomplete, but life insurance companies are believed to hold about \$3,000,000,000 of railroad securities at par value and other financial institutions about an equal amount additional.

Extensive receiverships would so injure these institutions that in all probability the Government would be called upon to step in. From this source arises the possibility of partial Government ownership of railroads as an ultimate development. Unless traffic volume improves, Government ownership is likely to be a subject of lively discussion in 1933.

The Far-Reaching Influence of the Railroad Debt Problem

Thus we observe that the debt problem has far-flung ramifications in our economic system. The fixed charges

on debt put pressure on the roads to cut down purchases of materials and supplies and to cut down the contribution to the national income. Moreover, the fixed charges have brought the Government into the financing problem through the Reconstruction Finance Corporation, thereby enhancing the deficit in the national budget.

Inability to earn fixed charges has led the security market to drive prices down to about one-half of par value in the aggregate and to levels in many cases which anticipate receiverships.

Nevertheless receiverships on an extensive scale would so menace life insurance companies and other institutions that it may well be doubted whether Government ownership would be avoidable, at least in many marginal roads, if receiverships occurred on as wide a scale as they are now being discounted by market prices.

▲▲ OBITUARY ▲▲

T. D. RUSSELL, vice-president of the Morgan Engineering Co., Alliance, Ohio, died suddenly in Pittsburgh on June 11. A native of Massillon, Ohio, he went to Alliance in 1886. He was treasurer of the Morgan company from 1901 to three years ago, when he was made vice-president.

HARRY P. USHER, president of Smith-Booth-Usher Co., dealers in a general line of machinery and contractors' equipment, Los Angeles and San Francisco, died on June 7 at his home at Los Angeles. Mr. Usher had been a resident of Los Angeles for the past 28 years.

WILLIAM LACY, founder and president of the Lacy Mfg. Co., pipe and tank fabricator, Los Angeles, died suddenly on June 11, aged 68 years. He was president of the Los Angeles Chamber of Commerce in 1924, headed the Community Chest for several years, and was a member of several bank directorates.

WALTER H. BALDWIN, who until his retirement three years ago from the vice-presidency of Adams & Westlake Co., Chicago, manufacturer of railway supplies, died June 19 at Highland Park, Ill.

Increased Employment in Philadelphia

May employment in the 45 firms reporting to the Metal Manufacturers' Association of Philadelphia totaled 27,216, exclusive of office employees, an increase of slightly less than 1 per cent for the month. The heavy pressed metal and light pressed metal groups are responsible for the increase, while all other groups decreased, the largest decrease being in the machine shop and foundry group.

1362—The Iron Age, June 23, 1932

PERSONALS



J. H. FITCH, Jr., formerly vice-president Newton Steel Co., who has been appointed manager of the Inland Steel Co.'s new branch office in Detroit.

W. L. HAYES, for many years manager of the Cleveland district wire mills of the American Steel & Wire Co., has retired and is succeeded by G. H. PETERS, whose title will be assistant to the vice-president. The office of district manager of wire mills has been abolished and the work is to be absorbed by the office of the vice-president in charge of operations. Mr. Hayes began his career in steel production in 1879 with the former Cleveland Rolling Mill Co. He continued with that company until Dec. 31, 1901, having advanced to superintendent of the mill, a position which had been held before him by his father, and went with the American Steel & Wire Co., but later became associated with W. J. Hayes & Sons, Cleveland bankers. He returned to the wire company on Jan. 1, 1907, as assistant manager of the Cleveland district. On Aug. 15, 1915, he was transferred to Chicago as district manager of wire mills, but returned to Cleveland as district manager on Jan. 1, 1925. Mr. Peters has been assistant manager of Cleveland district wire mills of the American Steel & Wire Co. for a number of years. He started in the steel business in 1898 with the Illinois Steel Co. and went with the American Steel & Wire Co. in Cleveland in 1900.

WILLIAM J. MORRIS has been elected president of the Continental Supply Co., St. Louis, subsidiary of the Youngstown Sheet & Tube Co. Mr. Morris became connected with

the Youngstown company in 1906. He was its treasurer from 1922 to 1925, and has been a vice-president of the company since April, 1925.

E. KAY FORD, who has been identified with the Detroit offices of the Hanna Furnace Corp., for some years, has been elected vice-president in charge of sales, succeeding the late D. M. Eddy. P. J. MORAN, of Buffalo, has been made vice-president in charge of operations, and WILLIAM KERBER, also of Buffalo, has become Eastern district sales manager.

WILLIAM L. DITGES, formerly vice-president in charge of engineering for the Mackintosh-Hemphill Co., Pittsburgh, has been appointed vice-president of the Pittsburgh Steel Foundry Corp., Glassport, Pa., and will have charge of the development of industrial and special machinery pertaining to the mill industry. Mr. Ditges had been identified with the Mackintosh-Hemphill company since 1916, having served as chief draftsman and chief engineer prior to his promotion to the vice-presidency. Before going with that company, he had served successively with the Carnegie Steel Co. at New Castle, Pa., the Nichols Copper Co., New York, and the Bethlehem Steel Co., Bethlehem, Pa.

A. J. FARAON has been added to the sales staff, welded process equipment division, of the Blaw-Knox Co., Pittsburgh. He is a graduate of Stevens Institute of Technology and was formerly identified with the A. O. Smith Corp.

GEORGE A. SPAULDING, heretofore Ohio district manager of sales, Bliss & Laughlin, Inc., Harvey Ill., has been appointed Eastern manager of sales, with headquarters at Buffalo. He has been identified with the sales department of the company for about 10 years.

GEORGE W. BURRELL, president of the Wellman Engineering Co., Cleveland, received the professional degree of mechanical engineer from Ohio State University at the commencement exercises last week.

FRANK J. SPRAGUE, who will be 75 years of age on July 25, will be honored on that day by a meeting of appreciation and tribute to be held in the Engineering Societies Building, New York. The anniversary committee for the "father of electric traction" numbers 74 engineers and

others, including presidents of engineering and educational institutions.

♦ ♦ ♦
JAMES R. LEAVELL, president, Continental Illinois Bank & Trust Co., Chicago, has been elected a director of the International Harvester Co., Chicago.

♦ ♦ ♦
FREDERICK BISSELL, president of the Super Service Vacuum Cleaner Co., Toledo, Ohio, was seriously injured June 17, when he was struck by an automobile at Winnetka, Ill.

S. M. KINTNER, vice-president and director of research for the Westinghouse Electric & Mfg. Co., East Pittsburgh, received the honorary degree of doctor of engineering from Purdue University, Lafayette, Ind., at the commencement exercises held on June 14.

♦ ♦ ♦
J. LEONARD REPLOGLE received 16 votes for the nomination for Vice-President in the Republican National Convention in Chicago.

European Steel Men See Steel Processes

Representatives of a number of European steel companies were guests of the Cold Metal Process Co., Youngstown, on June 6 and 7, to study the operation of the Youngstown company's Steckel mills for both hot rolling and cold rolling of sheet and strip steel. In order that the demonstration could compare in every way with actual conditions in European plants, steel ingots were shipped to this country from France and Great Britain, and reduced to slabs at the mills of the Sharon Steel Hoop Co. The foreign steel contained higher percentages of scrap than are usually encountered in American material.

The group was conducted by A. T. Kathner of Kathner & Dameron, Paris consulting engineers, with the cooperation of A. P. Steckel, president of the Cold Metal Process Co. and inventor of the Steckel mills.

Other European companies represented by members of the party were as follows: Stora Kopparbergs A. G., Domnarfvet, Sweden; Eisenwerk

Rothau-Neudek, Liscovec, Czechoslovakia; La Magona d'Italia, Piombino, Italy; Ferriere Piemontesi, Fiat, Turin, Italy, and Edelstahlwerk Roehling, Voelklingen (Saar).

On June 14 the European steel men visited the plant of the American Rolling Mill Co. at Middletown, Ohio, where they inspected the Armco continuous rolling mill process. There they were photographed with the Armco men who entertained them.

Executive Changes in Illinois Steel Co.

EUGENE J. BUFFINGTON retires on July 1 at his own request from the presidency of the Illinois Steel Co., and will be succeeded by GEORGE G. THORP, now vice-president. GEORGE COOK KIMBALL, of the American Sheet & Tin Plate Co., will succeed Mr. Thorp.

Mr. Buffington, who will retire under the United States Steel Corporation's pension plan, as the announcement on June 21 of the changes states, is a graduate of Vanderbilt University, Nashville, Tenn., of which

for many years he has been a member of the board of trustees. He has been identified with the iron and steel industry of the United States since 1884, first as director and treasurer of the American Wire Nail Co. at Covington, Ky., which company later

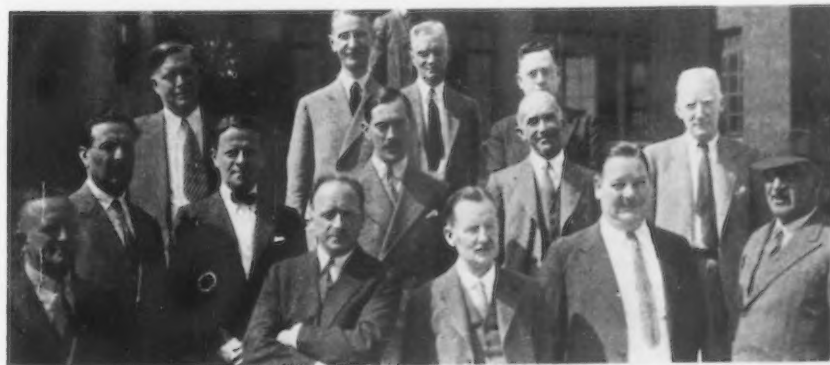


EUGENE J. BUFFINGTON

constructed a wire and nail plant at Anderson, Ind. Upon the acquisition of this latter property in 1898 by the American Steel & Wire Co. of Illinois, Mr. Buffington continued with that company as director, member of the executive committee and treasurer. In January, 1899, he was elected president of the Illinois Steel Co., succeeding John W. Gates, in which position he has since continued. Mr. Buffington will continue as a director of the Steel Corporation and he is a director of the Continental-Illinois Bank & Trust Co., Chicago.

Mr. Thorp, vice-president of the Illinois Steel Co. since 1905, is a graduate of University of Wisconsin. Entering the steel industry immediately following his graduation, he successively was connected with the Illinois Steel Co., Colorado Fuel & Iron Co., again with the Illinois company, and as general superintendent of the Clairton Works of Carnegie Steel Co., prior to accession to the Illinois vice-presidency. He had charge of the engineering and construction work of the Gary plant of Illinois Steel Co. and of its operations upon completion, also of the interests of the Steel Corporation in the City of Gary, Ind.

Mr. Kimball was graduated from Harvard University in 1900. He entered the steel industry in 1901 in the engineering department of the American Tin Plate Co. at Pittsburgh. In 1905 he was appointed chief engineer of the American Sheet & Tin Plate Co. and held that position continuously until 1931, when he was elected a vice-president of that company.



European steel men at the plant of the American Rolling Mill Co. at Middletown, Ohio. Front row, left to right: J. H. Middleton, John Summers & Sons, Ltd., Shotton, Chester, England; E. A. Emerson, Armco International Corp., Middletown, Ohio; H. T. Hildage, United Steel Corp., Sheffield, England; S. E. Graeff, American Rolling Mill Co.; E. Peter Jones, John Summers & Sons, Ltd., Shotton, Chester, England. Middle row, left to right: A. A. Bonnet, Chatillon Commentry & Neuves Maisons, Montlucon, France; R. A. Solberg, Armco International Corp., Paris, France; J. G. Guyot, Chatillon Commentry & Neuves Maisons, Montlucon, France; Arthur Kathner, consulting engineer, Paris, France; J. B. Tytus, American Rolling Mill Co. Back row, left to right: Bennett Chapple, American Rolling Mill Co.; E. J. Houbaer, S. A. Cockerill, Seraing, Belgium; William Stringham, American Rolling Mill Co., Middletown, Ohio; G. D. Tranter, American Rolling Mill Co.

... LETTERS TO THE EDITOR ...

An Importer of Steel Speaks

Editor, THE IRON AGE:

SINCE your campaign against foreign steel is becoming more intense and is gaining momentum with each issue, it would be an act of good sportsmanship and true American spirit to give the "other side" a chance to defend themselves and state their viewpoint.

The assertion is being made that the import of foreign steel is doing great damage to the industry, demoralizing it completely, and the campaign seems to have for its ultimate objective a virtual embargo against European steel.

Dispatches from Paris this morning flashed the good news that Ambassador Edge has just succeeded in drawing up a new favored nation commercial treaty with France, one of the supposedly offending countries, and dumping charges may have their boomerang.

We hardly blame you for your attitude if you really believe that this great American industry is actually threatened; but let us analyze the figures and see the extent of the damage done by the importation of a very limited tonnage:

The United States production of rolled finished steel during 1931 was over 19,000,000 tons. According to the tabulation in THE IRON AGE issue of Feb. 11, 1932, the importation of finished rolled steel was 225,000 tons. The approximate value of the domestic tonnage is over \$600,000,000 versus an import value of finished steel amounting to \$7,000,000. From the viewpoint of tonnage, this would be 1.2 per cent, and in dollars and cents it would be 1 per cent of the total steel used in the country. It requires a great imagination to claim that such an infinitesimal percentage represents any sort of danger to an industry. During the same period of 1931, America exported close to 1,000,000 tons of steel products of an approximate value of \$35,000,000. The tonnage ratio, therefore, on exports versus imports would be 4 to 1 and the ratio in dollars would be 5 to 1.

In an article written several years ago by James A. Farrell, ex-president of the United States Steel Corp., he laid emphasis upon the inexorable economic axiom that "you cannot expect to sell without buying." The Department of Commerce figures for 1931 show a 35 per cent to 40 per cent export balance in favor of this country against France, Belgium and Germany, the chief steel export countries. True, this favorable balance does not apply to steel products, but,

nevertheless, it is the American working man and American industries in other fields which have benefited by this favorable balance. Will you kindly explain to us how Europe can pay, even in part for the manufactured goods bought in America except by an exchange of goods?

Since the president of Bethlehem Steel Corporation has become an advocate of high protection and demands the virtual exclusion of all foreign products, the writer takes the liberty to draw his attention to the disastrous results of the Smoot-Hawley tariff act for the general import and export business, and with particular reference to the steel interests of the United States. May we add, that during 1929, just prior to the enactment of the new tariff act, American steel interests exported over 3,000,000 tons against 1,500,000 tons during the year 1930, the year following the enactment of the tariff act. The tremendous recession of 1930 was primarily due to the retaliatory measures taken by various countries as a rebuke to the Smoot-Hawley act. Nobody can claim that the drop in exports of 1930 was due to the depression, since that year was an excellent one for the world at large and for the steel industry, particularly. It is to be conceded, of course, that a further drop in steel exports during 1931 to 1,000,000 tons is partly explained by the depression.

Incidentally, during the rate discussion of the Smoot-Hawley tariff act, the domestic steel interests went on record, protesting most vehemently against the demands made by domestic producers of ferromanganese for a rate increase. It is generally known that the major importations of iron ore and pig iron, of which there has recently been an increase of 200 per cent, are bought and absorbed chiefly by our American steel rolling mills, disregarding the American producers and the working man, for whom such great love is professed. "It all depends whose ox is being gored." No claim can be made by our steel magnates for altruism as regarding the working man, since the recent wage slash would contradict same. Furthermore, the building of factories abroad by our large industries, wherever it suits their purpose and expediency, shows a complete disregard for our wage earners.

Under the present economic stress, the policy of further hampering imports is very questionable. The New York Times carried news several weeks ago of strong retaliatory measures contemplated by the Latins of South America against American manufactured goods as a further protest to the Smoot-Hawley tariff act. A great many of our leading economists attribute our present difficul-

ties partly to our high protection policy, which, seemingly, has paralyzed both the import and export trades, the veins and arteries of a highly developed industrial economic body, without in any way having benefited this country. We even question if the Hon. Mr. Smoot can claim that the new tariff act has proved the boon the sponsors had predicted.

It is also to be considered that for every ton of foreign steel imported, the United States Treasury, indirectly the American people, receives \$6.72 for every gross ton in duties; also that the major part of this cargo is shipped here in American ships, which, heaven knows, need freight badly, and is the means, also, of giving employment to American stevedores, loaders, truckmen, etc. Furthermore, it is the American consumer who receives the benefit of this competition.

A. J. LEO,
President, American Petrometal
Corpn., New York

Editor's Note: Mr. Leo entirely ignores the principal charge against foreign steel, i.e., that it is being dumped at prices that domestic makers cannot meet. It is because foreign importations are undermining our price structure, and not because they are yet of threatening volume, that our steel producers seek relief.

The writer's efforts to prove domestic steel producers inconsistent because they opposed a duty on manganese ore fail to impress those familiar with the facts. Our manganese deposits are not extensively developed and hence the fate of large capital investments and large payrolls was not involved. Moreover, our manganese resources are small—it is contended by some that they should be conserved for future emergencies—and by no stretch of the imagination would satisfy the normal needs of American industry.

General condemnation of the Hawley-Smoot tariff and threats of further retaliation by other countries are beside the point. Our first duty is to maintain employment in our own industries. Unless this is done, there will be no purchasing power to absorb the goods of foreign nations. No nation can live on the revenue that comes from import duties or the employment required in handling imported goods.

The writer's charge that American steel companies have not done their utmost to take care of the interests of their employees finds no support in the record since the depression set in. Anyone who has watched the financial statements of American steel companies knows that wage cuts were deferred as long as possible. In fact, it is precisely because the American steel industry wishes to protect its workmen from the pitifully low wage standards of Europe that it is so concerned about the dumping of foreign steel.

• • EDITORIAL COMMENT • •

Twenty-Five Millions for New Equipment

THERE is a mistaken belief, founded probably upon inadequate and fragmentary evidence, that the metal-working industry is sufficiently supplied with credit. And that the members of this industry, comprising the producers and consumers of metals and the builders of machinery and equipment would not make capital expenditures at this time, even were funds made available for the purpose.

The results of a survey, just completed by *THE IRON AGE*, and published on pages 1356-7 of this issue, point to the contrary.

For example, 89 companies, or 36 per cent of the 246 who replied on the relation of credit to their businesses, stated that they were directly hampered because of the refusal of bankers to extend reasonable loans. And 147 concerns, or close to 60 per cent of the same total, stated that easier credit terms would help them indirectly by helping their customers.

The above opinions undoubtedly refer to short term or "commercial" loans which would be sought for financing operations rather than for capital expenditures.

The possibilities in connection with the use of longer credits are indicated in the replies from 50 concerns each of which stated the definite sum that it would invest in plant improvement providing funds for that purpose could be obtained. The total for the fifty companies aggregates \$1,783,500, or an average for each of the fifty of \$36,500. As stated on page 1357, this typical cross-section of the larger metal-working plants reached by *THE IRON AGE* indicates an immediate buying potential for over \$25,000,000 for capital equipment, temporarily suspended or postponed through inability to finance through bond issues or through bankers.

Evidently the recognition of the need of modernization is still very much alive in the metal-working industry, even though the ability to borrow for that purpose is temporarily frozen. There is food for thought in this for the Reconstruction Finance authorities and their banking associates as well as for the equipment manufacturer who will some day have the opportunity of supplying an accumulated demand.

Meticulous Inspection Is Hurting Now

METICULOUS inspection is a disease which has again broken out in industry. For insignificant reasons materials and products are being rejected. Defects are discovered that are difficult so to classify under the most stringent of specifications. They would have no effect on either quality or performance, yet suppliers are being harassed in this detail at a time when leniency, if anything, should prevail.

The explanation seems to be that some of the watchdogs on purchases feel an insecurity in their employment. They contrive to establish by their rigid interpretations

the importance of their department. They try to make themselves conspicuous as essential cogs in the industrial machine. Instead, by injudicious action they jeopardize their connections by becoming a nuisance.

What they do not envision is the effect of similar inflexibility in the treatment of products of their own companies. It is the old story of the purchasing official who deals with sellers as he would not have his own company's salesmen treated. The need is for the chief executives to see that sources of supply are accorded the same generosity they expect from customers. Complaints of unfair inspection should be a sign that one's own house be put in order. Inspectors are not wholly to be blamed. They should be reassured regarding their value, so they do not make foolish gestures to retain their jobs. The problem calls for a little consideration now and then to a minor item of manufacturing from the big chief.

Funds for Construction or Relief

WHETHER the proponents say so or not, the only logical ground for spending public money in construction work is that of starting an ascending spiral in general activity. In the whole history of industry ascending and descending spirals have been observable, increasing activity at one point causing more activity at another, that in turn at another and so on around to the first, the descending spiral being simply a reversal of this process. The process is perfectly simple and the thing is inescapable, within limits. The difficulty is as to the limits, for an ascending spiral eventually runs into trouble and, as we all know from recent experience, so does a descending spiral.

It would be a good thing to stop an ascending spiral at a safe point, not let it go so high as to get into trouble, but it simply is not done. Probably the majority of men have forgotten that when Mr. Hoover became Secretary of Commerce he had a definite plan to "smooth out the business cycle," as it was called, by setting up comprehensive monthly reports of all sorts of business activity, whereby when one could observe that activities were gaining too much speed he would become conservative. But when men observed new records being made they just said: "Ha! This is a New Era."

All these proposals for spending money on construction work should be judged solely on the basis of one test: Are they calculated to start an ascending spiral?

It is far from efficient to start such construction work merely to put money into circulation. The stream of money may not go far, drying up. If putting of money in circulation is the criterion, then relief is much better. Relief money is sure to be spent promptly and economically. It can be guided precisely and put where it will do the most good. As spent it makes demand for food, clothing, etc., which is desirable. But it is very hard to imagine its tending to start an ascending spiral. These are the plain and simple measures by which money disbursing proposals should be judged and classified.

Facts and Opinions in the Metal-Working Industry

(Concluded from page 1357)

involving a total of \$1,783,500, or an average of \$35,600 per reporting plant.

Dividing this total among the 277 concerns answering the questionnaire, and including of course both those who do not intend to make capital expenditures and those who may have funds for the purpose and who therefore did not reply to this question, the cross-sectional average is \$6,440 per company.

Using this factor in connection with the 4000 concerns which in normal times do a business of \$500,000 per annum or upwards (of which the survey is typical) gives a potential market for capital goods in our industry of over \$25,000,000, providing the funds could be obtained.

Market Research and New Products

Market Research

To the question "Are you conducting market research for the purpose of uncovering new outlets?" 167 replied in the affirmative and 77, out of a total of 244, in the negative.

New Products

Of a total of 248 concerns, 167 consider the development of new products as requisite to regaining adequate volumes, 81 do not consider this to be so, as applied to their businesses.

Opinion on Important Economic Questions

Manufacturers' Excise Tax

Of a total of 236 answering the question "Do or do you not favor the manufacturers' excise or 'sales' tax?", 194 favor it and 42 do not.

Recognition of Russia

Of a total of 223 who expressed opinions on this question, 85 are in favor of the recognition of Russia by our government and 138 are opposed to it.

Public Works

Of a total of 254 concerns, 82 state that the undertaking of public works would materially stimulate their businesses. One hundred and seventy-two concerns state that it would not affect them materially.

Direct Aid to Unemployed

Of a total of 242, 112 prefer direct aid to the unemployed rather than through Federal and other construction projects. Construction projects, as an aid to employment are favored by 130.

British Tin Plate Trade Gains; Soviet Places Large Steel Orders

International Association Reduces Rail Price — Krupp Company Reemploys 5000 Workers

LONDON, ENGLAND, June 20 (By Cable).—The British imports advisory committee is considering the question of recommending ex-

tension of the temporary additional steel duties which expire July 25.

The Lausanne conference imparted a better tone to markets generally, though iron and steel are slow to respond. The Continental market is uncertain, with producers endeavoring to resist the fall in prices but with orders badly needed.

Activity is reviving in tin plate and some works are now well booked, with the result that prices are rising, demand is widespread and the outlook is considered favorable. Tin mill output ranges from 60 to 65 per cent and is likely to be maintained at that rate.

The International Rail Makers' Association has reduced the gold price of rails by 7s. 6d. to £5 10s., f.o.b. Continental ports. Friedrich Krupp A.G. is reopening its Rheinhausen works, reemploying about 5000 workers.

The Soviet trade delegation in Berlin and the German steel works association amicably settled the question of the Russian option on 150,000 tons of rolled steel by canceling the option and placing part of the order with the steel works association. The Polish Kattowitz A.G. Königs und

Laurahütte booked 50,000 tons of rolled steel for Russia.

The Yugoslav makers are protesting to the Central European group of the Continental raw steel cartel because of the large foreign exports to Yugoslavia and are likely to protest to their own government for protective action unless such exports are drastically curtailed.

Sheet Sales and Output Declined in May

Sales and production of steel sheets by independent mills declined in May, but shipments increased, according to the monthly report of the National Association of Flat Rolled Steel Manufacturers. Total sheet sales by independent makers were 91,414 net tons, against 103,011 tons in April; production last month was 96,180 tons against 101,559 tons in April; shipments were 106,893 tons against 104,637 tons in April. The April report and comparison in net tons follow:

	May	April	March
Sales	91,414	103,011	101,559
Production	96,180	101,559	110,559
Shipments	106,893	104,637	117,685
Unfilled orders	85,228	99,510	102,171
Unshipped orders	46,400	45,021	55,331
Unsold stocks	74,966	71,318	68,677
Capacity per month	547,000	555,000	555,000
Percentage reporting ..	68.2	68.7	68.7

Percentages, Based on Capacity			
Sales	24.5	27.0	26.6
Production	25.3	26.6	29.0
Shipments	28.6	27.4	30.8
Unfilled orders	22.8	26.1	26.8
Unshipped orders	12.4	11.8	14.5
Unsold stocks	20.1	18.7	18.0

British Prices, f.o.b. United Kingdom Ports

Per Gross Ton		
Ferromanganese, Export £9 0s.		
Billets, open-hearth...	4 17	6d to £5 7s. 6d
Black sheets, Japanese specifications	9 12	6
Tin plate, per base box	15 0	to 15 6
Steel bars, open-hearth	7 17½	to 8 7½
Beams, open-hearth...	7 7½	to 7 17½
Channels, open-hearth...	7 12½	to 8 2½
Angles, open-hearth...	7 7½	to 7 17½
Black sheets, No. 24 gage	8 0	to 8 10
Galvanized sheets, No. 24 gage	9 5	to 9 7 6

Continental Prices, f.o.b. Continental Ports

Per Metric Ton, Gold £ at \$4.86		
Billets, Thomas	£1 19s.	
Wire rods, No. 5 B.W.G.	4 10	
Black sheets, No. 31 gage, Japanese	11 5	
Steel bars, merchant...	2 4	to £2 5s.
Beams, Thomas	2 1	6d
Angles, Thomas, 4-in. and larger	2 3	
Angles, small	2 5	
Hoops and strip steel over 6-in. base	3 5	
Wire, plain, No. 8	5 7½	
Wire, barbed, 4-pt., No. 10 B.W.G.	8 15	

SUMMARY OF THE WEEK'S BUSINESS

Steel Production Gives Further Ground; Scrap Composite Falls to New Low

Ingot Output Not Above 16 Per Cent; Impending Mid-Summer
Suspensions Make Upturn Before August Unlikely

IN a market in which demand is yet to show signs of reviving, both steel production and scrap prices have reached new low levels. Ingot output has declined at Pittsburgh, Chicago, Buffalo, Detroit and in the Valleys, and the national average is now barely 16 per cent, as compared with 18 per cent a week ago.

Operations are becoming increasingly intermittent and complete suspension by some of the smaller independent plants is now in early prospect. Similarly mid-summer shutdowns of numerous steel-consuming companies, as well as foundries, are imminent. In fact, the iron and steel industry is resigned to the possibility that there will be no marked change for the better before August at the earliest.

Weakness in scrap prices is general, with declines most notable at Chicago, Pittsburgh and St. Louis. Recessions at Pittsburgh and Chicago have driven THE IRON AGE composite price for steel scrap down to \$6.83 a gross ton, a new all-time low.

CONSPICUOUS among the few supporting influences in a discouraging situation are sustained specifications for tin plate and a good flow of releases for public projects and for the Ford Motor Co. Tin mill operations are holding at 50 per cent of capacity. State and Federal construction jobs continue to make up the bulk of structural and reinforcing bar awards, although the volume of new work coming out for figures is on the decline. Ford is maintaining output at 5000 cars a day, equally divided between fours and eights, but most other motor car makers are tightening their belts in anticipation of a lean summer. An apparent exception is Plymouth, which had its largest production day in history last Thursday when it turned out 1543 cars and which estimates this week's shipments at 8000 units.

THE favorable sentimental response to the improvement in the financial situation and the impending adjournment of Congress has failed to translate itself into business betterment. Whether

industry, unaided, can pull itself out of the rut of depression is coming to be recognized as a question involving more than monetary stability or the passing of legislative dangers at Washington.

Government aid to private corporations may prove imperative. If such assistance were made available through the Reconstruction Finance Corporation, it is likely that steel companies and other industries would make sizable expenditures for modernization. The reported plan of enabling the railroads to undertake large expenditures for rolling stock and other requirements through loans from the R. F. C. unfortunately seems unlikely to materialize. Such aid to our transportation lines would call for amendment to the Reconstruction Finance Corporation act, of which there is little prospect on the eve of adjournment of Congress.

Meanwhile railroad buying is at low ebb. Rail production has ceased in the Chicago district, and rail mills at Pittsburgh and Ensley are also inactive.

OUTSTANDING among pending tonnages for Federal projects is the steel for large-diameter outlet pipes for the Hoover Dam. From 52,000 to 60,000 tons of plates will be required, depending on which of three alternative contracts is placed. The Babcock & Wilcox Co., New York, and the Western Pipe & Steel Co., San Francisco, are the low bidders, but different freight rates and other variations make it uncertain as to which actually submitted the lowest tender. Announcement of the award will be by the Bureau of Reclamation, Washington.

The reaffirmation of most finished steel prices for third quarter has been followed by the announcement of steel companies that they will cancel all low-price contracts on June 30. Users, however, have shown no interest in building up their stocks to take advantage of such hold-over quotations.

THE IRON AGE composite prices for finished steel and pig iron are unchanged at 2.087c. a lb. and \$14.01 a ton respectively.

▲ ▲ ▲ A Comparison of Prices ▲ ▲ ▲

Market Prices at Date, and One Week, One Month and One Year Previous,
Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron

	Jun. 21, 1932	Jun. 14, 1932	May 24, 1932	Jun. 23, 1931
<i>Per Gross Ton:</i>				
No. 2 fdy., Philadelphia.....	\$14.84	\$14.84	\$14.84	\$17.26
No. 2, Valley furnace.....	14.50	14.50	14.50	17.00
No. 2 Southern, Cincinnati...	13.82	13.82	13.82	14.69
No. 2, Birmingham.....	11.00	11.00	11.00	12.00
No. 2 foundry, Chicago*.....	16.00	16.00	16.00	17.50
Basic, del'd eastern Pa.....	16.00	16.00	16.00	17.00
Basic, Valley furnace.....	14.00	14.00	14.00	15.50
Valley Bessemer, del'd P'gh...	16.89	16.89	16.89	18.76
Malleable, Chicago*.....	16.00	16.00	16.00	17.50
Malleable, Valley.....	15.00	15.00	15.00	17.00
L. S. charcoal, Chicago.....	23.17	23.17	23.17	25.04
Ferromanganese, seab'd car- lots	68.00	68.00	75.00	85.00

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

Finished Steel

	Jun. 21, 1932	Jun. 14, 1932	May 24, 1932	Jun. 23, 1931
<i>Per Lb. to Large Buyers:</i>				
Hot-rolled annealed sheets, No. 24, Pittsburgh.....	2.20	2.20	2.20	2.15
Hot-rolled annealed sheets, No. 24, Chicago dist. mill	2.30	2.30	2.30	2.35
Sheets, galv., No. 24, P'gh...	2.85	2.85	2.85	2.70
Sheets, galv., No. 24, Chicago dist. mill	2.95	2.95	2.95	2.85
Hot-rolled sheets, No. 10, P'gh	1.55	1.55	1.55	1.70
Hot-rolled sheets, No. 10, Chi- cago dist. mill.....	1.65	1.65	1.65	1.80
Wire nails, Pittsburgh.....	1.95	1.95	1.95	1.80
Wire nails, Chicago dist. mill	2.00	2.00	2.00	1.85
Plain wire, Pittsburgh.....	2.20	2.20	2.20	2.20
Plain wire, Chicago dist. mill	2.25	2.25	2.25	2.25
Barbed wire, galv., P'gh.....	2.60	2.60	2.60	2.55
Barbed wire, galv., Chicago dist. mill.....	2.65	2.65	2.65	2.60
Tin plate, 100-lb. box, P'gh...	\$4.75	\$4.75	\$4.75	\$5.00

Rails, Billets, etc.

<i>Per Gross Ton:</i>				
Rails, heavy, at mill.....	\$43.00	\$43.00	\$43.00	\$43.00
Light rails at mill.....	32.00	32.00	34.00	34.00
Rerolling billets, Pittsburgh...	26.00	27.00	27.00	29.00
Sheet bars, Pittsburgh.....	26.00	26.00	26.00	29.00
Slabs, Pittsburgh.....	26.00	27.00	27.00	29.00
Forging billets, Pittsburgh...	33.00	33.00	33.00	35.00
Wire rods, Pittsburgh.....	37.00	37.00	37.00	35.00
	Cents	Cents	Cents	Cents
Skelp, grv'd. steel, P'gh, lb....	1.60	1.60	1.60	1.65

Old Material

<i>Per Gross Ton:</i>				
Heavy melting steel, P'gh...	\$8.75	\$9.00	\$9.50	\$10.00
Heavy melting steel, Phila...	6.25	6.25	6.50	8.50
Heavy melting steel, Chicago	5.50	5.75	6.25	8.75
Carwheels, Chicago.....	5.50	5.50	6.25	10.00
Carwheels, Philadelphia.....	8.00	8.00	9.00	12.00
No. 1 cast, Pittsburgh.....	9.00	9.00	9.25	10.25
No. 1 cast, Philadelphia.....	8.00	8.00	8.00	11.50
No. 1 cast, Ch'go (net ton)...	6.00	6.00	6.50	9.00
No. 1 RR. wrot., Phila.....	8.50	8.50	8.50	10.00
No. 1 RR. wrot., Ch'go (net)	3.75	3.75	4.25	7.00

Finished Steel

<i>Per Lb. to Large Buyers:</i>				
Bars, Pittsburgh.....	1.60	1.60	1.60	1.65
Bars, Chicago.....	1.70	1.70	1.70	1.70
Bars, Cleveland.....	1.65	1.65	1.65	1.65
Bars, New York.....	1.95	1.95	1.95	1.98
Tank plates, Pittsburgh.....	1.60	1.60	1.60	1.65
Tank plates, Chicago.....	1.70	1.70	1.70	1.70
Tank plates, New York.....	1.898	1.898	1.898	1.93
Structural shapes, Pittsburgh	1.60	1.60	1.60	1.65
Structural shapes, Chicago...	1.70	1.70	1.70	1.70
Structural shapes, New York	1.86775	1.86775	1.86775	1.90 1/2
Cold-finished bars, Pittsburgh	1.70	1.70	1.70	2.10
Hot-rolled strips, Pittsburgh	1.40	1.40	1.40	1.55
Cold-rolled strips, Pittsburgh	2.00	2.00	2.00	2.15

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Coke, Connellsville

<i>Per Net Ton at Oven:</i>				
Furnace coke, prompt.....	\$2.00	\$2.00	\$2.25	\$2.40
Foundry coke, prompt.....	3.00	3.00	3.00	3.50

Metals

<i>Per Lb. to Large Buyers:</i>				
Lake copper, New York.....	5.50	5.50	5.50	8.37 1/2
Electrolytic copper, refinery...	5.12 1/2	5.12 1/2	5.00	8.00
Tin (Straits), New York....	19.50	19.00	21.10	23.95
Zinc, East St. Louis.....	2.80	2.80	2.60	3.50
Zinc, New York.....	3.17	3.17	2.97	3.85
Lead, St. Louis.....	2.90	2.90	2.90	3.97 1/2
Lead, New York.....	3.00	3.00	3.00	4.15
Antimony (Asiatic), N. Y....	5.12 1/2	5.12 1/2	5.12 1/2	6.25

▲ ▲ ▲ The Iron Age Composite Prices ▲ ▲ ▲

Finished Steel

June 21, 1932	2.087c. a Lb.
One week ago	2.087c.
One month ago	2.087c.
One year ago	2.102c.

Based on steel bars, beams, tank plates, wire, rails, black pipe and sheets. These products make 87 per cent of the United States output.

	HIGH	LOW
1932	2.087c., Mar. 29;	2.037c., Jan. 19
1931	2.142c., Jan. 13;	2.052c., Dec. 29
1930	2.362c., Jan. 7;	2.121c., Dec. 9
1929	2.412c., April 2;	2.362c., Oct. 29
1928	2.391c., Dec. 11;	2.314c., Jan. 3
1927	2.453c., Jan. 4;	2.293c., Oct. 25
1926	2.453c., Jan. 5;	2.403c., May 18
1925	2.560c., Jan. 6;	2.396c., Aug. 18

Pig Iron

\$14.01 a Gross Ton
14.06
14.22
15.63

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

HIGH		LOW	
\$14.81, Jan.	5:	\$14.01, June	7
15.90, Jan.	6:	14.79, Dec.	15
18.21, Jan.	7:	15.90, Dec.	16
18.71, May	14:	18.21, Dec.	17
18.59, Nov.	27:	17.04, July	24
19.71, Jan.	4:	17.54, Nov.	1
21.54, Jan.	5:	19.46, July	13
22.50, Jan.	13:	18.96, July	7

Steel Scrap

\$6.83 a Gross Ton
7.00
7.41
9.08

Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

HIGH		LOW	
\$8.50, Jan.	12;	\$6.83, June	21
11.33, Jan.	6;	8.50, Dec.	29
15.00, Feb.	18;	11.25, Dec.	9
17.58, Jan.	29;	14.08, Dec.	3
16.50, Dec.	31;	13.08, July	2
15.25, Jan.	11;	13.08, Nov.	22
17.25, Jan.	5;	14.00, June	1
20.83, Jan.	13;	15.08, May	6

Finished Steel Specifications Again Decline in Pittsburgh District

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PITTSBURGH, June 21.—A downward tendency in the rate of finished steel specifications reaching Pittsburgh district companies is still apparent. An exception is tin plate, releases for which were slightly heavier last week. Some other products on which new base prices and extras have been established for third quarter also show minor increases, because material is being taken out on old contracts which expire June 30. However, in the case of bars, plates and shapes, sheets and other products, the end of the quarter is bringing no change in demand, even though some consumers now enjoy better prices than they would be able to get on new contracts. It is the intention of steel companies to cancel all low-price contracts at the end of this quarter, but users of steel show no interest in building up their stocks in order to take advantage of favorable prices.

The principal steel consuming industries may all be classed as dormant except the automobile group, which is aided considerably by the comparatively heavy releases of the Ford Motor Co. Shipments of structural steel and reinforcing bars are also holding up fairly well, but new business is confined principally to public works. Wire products are exceptionally dull. Third quarter steel inquiries from the railroads represent a mere fraction of normal buying. Tin plate shipments are running ahead of production because part of the tonnage now being ordered out has been anticipated by the mills.

Pittsburgh district steel ingot production is a little lower, being estimated this week as scarcely 14 per cent of capacity. The prospect of complete suspension by some of the smaller independent plants which have been running at a fractional rate would indicate that an even lower level would be reached during July. In the Valleys and northern Ohio plants outside of the Cleveland district steel production stands at about 16 per cent. The rate would be even lower if it were not for two large Steel Corporation units to which tonnage has been diverted from other mills. Steel production in the Wheeling territory is holding its own at 35 per cent of capacity, with a large Bessemer plant in that district engaged at about 90 per cent.

Finishing mill schedules in the three

Steel releases have diminished in all lines except tin plate.

* * *

Ingot output at Pittsburgh has dropped to 14 per cent of capacity, but has declined to 16 per cent in the Valleys.

* * *

Heavy melting scrap has again given ground, declining 50c. a ton.

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districts show no pronounced change, although sheet and strip output is lower. The rolling mills generally are slightly more active than steel furnaces, indicating that steel producers are letting their raw steel stocks decline to a very low level.

Raw material prices are still very weak in sharp contrast to finished steel quotations which give promise of stability in nearly all lines.

Pig Iron

Even carload sales are becoming less frequent in this market, and shipments to foundries during June have been extremely light. Prices are difficult to determine in the absence of significant buying, but are unchanged at recent nominal levels. No merchant stacks are in blast, and stocks in the Pittsburgh and Valley districts are not high enough to prompt price weakness.

Semi-Finished Steel

No buying of billets, slabs and sheet bars for third quarter has been reported, and the market is fairly well defined at \$26, Pittsburgh. The higher asking price announced some time ago seems to have disappeared. Forging billets are holding at \$33, Pittsburgh, and wire rods are steady at \$37.

Rails and Track Accessories

One or two third quarter inquiries for track accessories have been issued, but indicated tonnage is very light. Releases on rails have practically ceased, and the local producing unit is inactive.

Bolts, Nuts and Rivets

Producers report extension of third quarter contracts is being obtained

without difficulty and present discounts seem to be holding. Quotations on cap and set screws have been advanced by the lowering of discounts. Demand for bolts and nuts averages about 15 per cent of the industry's capacity.

Bars, Plates and Shapes

State and Federal public works continue to make up the bulk of structural and reinforcing bar awards, but new inquiry on this type of business is lighter. Considerable work still remains to be closed. Several of the railroads have issued inquiries for their finished steel requirements in the third quarter, but tonnages are generally small. The Western Maryland is building a few freight cars in its own shops, but not much steel is being bought in the open market. Demand for heavy hot-rolled products from the manufacturing industries is generally very light, and business in both merchant and alloy steel bars seems to be tapering off.

Third quarter contracts are being taken at 1.60c., Pittsburgh, and mills expect to cancel tonnage now on their books at lower figures if it is not ordered out by June 30. This decision is not resulting in much of an increase in current specifications.

Cold-Finished Steel Bars

Third quarter contracts based upon the single price of 1.70c., Pittsburgh, applying on large lots are now being closed. Some large users to benefit by the new setup are already being sold on that basis. Small buyers are more reluctant to make the change. A slight increase in specifications is reported by some companies as a result of the expected cancellation of all unspecified tonnage on June 30.

Sheets

Releases from the Ford Motor Co. constitute the principal feature of this market, which has grown steadily less active during the month. Production this week is at the lowest level of the year, being estimated at only about 18 per cent of capacity. None of the principal consuming industries is showing any particular activity.

Prices are unusually well sustained on some finishes, including galvanized, but hot-rolled annealed material and automobile body sheets are still

rather weak. Efforts to advance the price on hot-rolled annealed sheets to 2.20c., Pittsburgh, for all classes of buyers are not entirely successful, and a differential of \$2 a ton may be allowed to stand in some cases. This is particularly true in the case of manufacturers of steel drums and metal lath. Reduced pickling extras on hot-rolled and hot-rolled annealed material are now being quoted by all the leading producers.

Tubular Goods

The pipe market is generally quiet in all departments, with current business justifying a production rate of 10 to 15 per cent. The expected inquiry from the Standard Oil Co. of Kansas for 100 miles of line pipe will probably be cut in half. Other definite line pipe business is lacking. Oil country goods are going to the east Texas fields in comparatively good volume.

Wire Products

The wire market is generally dull, and producers look for no sustained improvement for another six weeks. At that time buying of merchant items in the agricultural district is expected to show some gain. The prospect for manufacturers' wire is less clearly defined and depends largely upon general business conditions. The price structure is fairly well maintained, with manufacturers' wire quoted at 2.20c., Pittsburgh, and nails at \$1.95 a keg.

Tin Plate

Specifications showed slight gains last week, partially because material for August shipment is supposed to be released by June 15. Production schedules are affected in some plants, but others had anticipated this tonnage with higher schedules early in the year. As a result the industry shows no specific gains in its production rate, although the recent 50 per cent average is easily maintained. Shipments are running at a slightly higher figure.

Coke and Coal

Coke shipments to the foundries in this district are dragging along at the recent low rate, with no signs of an immediate pickup. Furnace coke is even less active, and the coal requirements of both manufacturers and railroads show no change. Foundry coke is quoted at \$3 to \$4.25, Connellsville, while the furnace grade is available at \$2 to \$2.15, Connellsville.

Warehouse Business

Sales of steel products out of warehouse have undergone seasonal contraction and are not holding up to the low levels of May. Warehouse stocks are light, but are more than sufficient to take care of the small orders which make up the bulk of current ware-

house business. Prices are fairly well maintained on most products and quantity differentials are being obtained. Bolts and nuts are somewhat stronger, reflecting the firmer price levels of the makers and are generally quoted at 70 per cent off list. As mentioned previously, cold-finished steel bars have been adjusted to the new single price basis recently announced by producers.

Strip Steel

The new single base price on hot-rolled strip steel is being applied on third quarter contracts, but advance bookings are slow to come in. Current specifications are exceptionally light, and would be much lower if it were not for the tonnage being placed from time to time by the Ford Motor Co. Mills generally consider the base price for third quarter to be 1.50c., Pittsburgh, although it is freely admitted that a concession of \$1 a ton will be made to large buyers. Prices on cold-rolled strip are sustained at

2c., Pittsburgh, but very little tonnage is coming out.

Scrap

In another week in which mill purchases have been lacking, the market has slumped to lower levels because of the weakness in dealer buying prices. No. 1 heavy melting steel is freely available at as low as \$8.25, and distress lots can be had for less. In view of this, the market is quotable at \$8.25 to \$9.25, the higher figure representing the last figure paid for steel by a mill. No. 2 steel is also lower, and hydraulic bundles can be bought at a reduction from recent levels. Heavy breakable cast is the only item showing any strength, recent consumer purchases having been made at \$8.50. Machine shop turnings are lower on the basis of a sale into consumption at \$5.50. Prices on the other grades are largely nominal, with distress cars bringing out figures which could hardly be duplicated by purchases of significant tonnage.

Bids on 60,000 Tons of Plate Work for Hoover Dam Feature Pacific Coast Market

SAN FRANCISCO, June 21.—Announcement has been made that Babcock & Wilcox Co., New York, and the Western Pipe & Steel Co., San Francisco, are the low bidders on the contract to furnish from 52,000 to 60,000 tons of plates for tunnel lining and pipe for the Hoover Dam. Owing to different freight rates and other variations, it has not yet been determined which of the two companies actually submitted the lowest tender.

Of the three alternatives offered one called for four 30-ft. diameter plate steel headers, penstocks and fittings, involving about 52,000 tons. The Babcock & Wilcox Co. was low with a bid of \$10,908,000, while the Western Pipe & Steel Co. made no bid. On the second alternative, which called for 28 13-ft. diameter outlet pipes and sections, requiring approximately 55,-

000 tons, the Babcock & Wilcox Co. bid \$9,750,000, while the Western Pipe & Steel Co. bid \$9,778,000. Sixteen 17½-ft. outlet pipes and sections, calling for about 60,000 tons, were specified in the third alternative. On this the Babcock & Wilcox Co. bid \$11,044,000, against \$11,263,000 for the Western Pipe & Steel Co. Announcement of the award will be made by the Bureau of Reclamation at Washington. The placing of 2500 tons of plates and shapes for bulkhead gates at the Hoover Dam is still deferred.

Bids were taken June 20 for construction of various buildings at the Hamilton Field bombing base at Marin Meadows, Cal. Approximately 900 tons of structural steel is required.

Demand for Pig Iron and Sheets Better at Cincinnati

CINCINNATI, June 21.—Carload orders for pig iron have shown a small increase. Total bookings for the week were less than 1000 tons, but consumers who have been out of the market for some time are showing interest in purchases. No noticeable increase in the melt is reported, but some foundries indicate slightly better business. Prices are relatively firm in the absence of test.

Steel

Following a slight buying flurry to escape new Federal taxes, demand for sheets settled to the level that has prevailed for the past several weeks. Buying is in small scattered lots. Production is still about 25 per cent of capacity.

Coke

Shipments of foundry grades are holding up, but new business is small.

Scrap

Dealers' bids continue nominal, but without test. Buying interest is almost nil. Small amounts of material are moving on old contracts.

Chicago Steel Production Recedes to 15 Per Cent; Rail Mills Have Shut Down

CHICAGO, June 21.—Ingot output has suffered another setback, with the average now not above 15 per cent of capacity. Two steel mill units are all but idle this week and others find their backlogs steadily diminishing. Rail rolling operations have stopped, but track accessories continue to move in fair volume. Prospects for orders from the railroads are very slim, though some producers of steel anticipate that a few small emergency rail orders are about due to come into the market. Although the general level of bar specifications is lower, there is a slight improvement in demand from small manufacturing concerns that are away from centers of dense population.

Prices are all being reaffirmed for the third quarter. In some commodities there is a strong tendency to narrow the circle of preferred buyers, while in others the buyers who can get concessions are undeniably more numerous.

Rarely, if ever, has the scrap market experienced such stagnation as obtains today. Here and there a foundry will take a carload, but there is no movement of the heavy tonnage grades to steel mills and forced liquidation on the part of yard dealers only adds to confusion as to prices.

Pig Iron

Deliveries so far in June are running neck and neck with the May rate, but the mid-year inventory period is near at hand and a drop may be expected. On the other hand, there is a note of encouragement in the fact that June shipments are holding at a time when deliveries normally recede. Sales are very light in all grades.

Cast Iron Pipe

This market is enlivened by an inquiry from Milwaukee calling for about 3800 tons of 24 to 36-in. pipe. This is only one of a number of improvements contemplated by the water department of that city. Another development in Wisconsin is the dissolution of an injunction granted the Burlington Railroad which for a time threatened to hold back construction of a dam at Alma. This project will now go ahead and require some cast iron pipe. Sellers are hopeful that Federal loans will be made to municipalities and that part of the money

Steel ingot output declines to rate of 15 per cent of capacity.

* * *

Scrap market is stagnant and heavy melting grade has again declined.

* * *

Rail production has stopped and prospects of further railroad business are poor.

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so obtained will be used in extension of water mains.

Wire Products

A seasonal dip in demand is in evidence, but the change is less pronounced than has been the case in previous years. The drop is not excessive in any one direction, nor is any branch of the trade taking heavier tonnages as an offset to declines in other directions. The St. Louis area and the Northwest appear to be slackening demand at a slower rate than other sections of the country. Prices remain steady and some forward contracting is under way.

Rails and Track Supplies

All Chicago rail mills are idle, with little prospect of resuming operations in the near future. Some sellers look for small emergency rail orders from time to time, but the problem is to accumulate sufficient tonnage for a rolling schedule. Accessory orders and specifications are lighter.

Sheets

Demand has dropped sharply and is not now above 10 per cent of capacity. Forward buying is listless as sellers attempt to carry present prices forward into the third quarter.

Bars

Consumption of bars is lighter, but most of the loss in tonnage is a result of curtailment by automobile manufacturers. In fact, there is a tendency for small miscellaneous manufacturers to take larger quantities. The 1.70c. quotation on mild steel bars is being carried forward to the third quarter. Demand for rail steel bars is spotty.

Plates

Market interest centers in 50,000 tons for penstocks and large-diameter

pipe for the Hoover Dam. Milwaukee is planning several water tanks, and bids will soon be opened on a Mississippi River dam at Alma, Wis. Oil tank demand is dull and there is virtually no promise of tonnage in pipe lines and railroad equipment.

Structural Material

Activity is confined to miscellaneous bridge work. Iowa has about completed its program, but Illinois, Wisconsin and Indiana still have some tonnage to place.

Bolts, Nuts and Rivets

Monday's mails brought in the largest tonnage of orders, notwithstanding that they were individually small, that had been booked in many weeks. This change was unforeseen, and the test will be whether or not the gain is sustained in weeks to come.

Reinforcing Bars

Business remains very dull, with only a few public projects at the point of closing. Competition has accentuated and territorial limits, as usually established by freight rates from centers of production, are near the point of being wiped out. Shipments of bars for road work are slowly creeping up and contractors still have a round tonnage to buy.

Scrap

The scrap market has reached a new stage of dullness in that shipments of heavy melting steel to mills have practically ceased. Brokers, having no outlet for their purchases, are refusing dealers' offers, and there is no accurate way to determine actual price levels. Brokers are paying \$2 to \$2.50 a ton for cast iron borings that are being unloaded on docks in the absence of consumer demand.

Detroit Scrap Market Is Listless

DETROIT, June 21.—The local scrap market is listless. The district steel plant is out of the market for at least 30 days, due to sharp contraction in open-hearth operations. Rather than sell its scrap at current prices, the Chrysler Corp. is withholding it and, except for a few special grades, is prepared to store it over an indefinite period. Quotations are nominal.

Eastern Pennsylvania Mill Operations Still Declining

Mild Improvement Shown in Small Structural Jobs—Two Large Public Projects to Be Figured

PHILADELPHIA, June 21.—Mild improvement has developed in small jobs for plates and shapes. Whether it is only a temporary upswing remains to be seen. Otherwise the market continues to be listless and operations are down another point to about 13 per cent. Prices of plates, shapes, bars and sheets now have been reaffirmed by all mills in this district at the second quarter levels.

Manufacturers are marking time and are not inclined to predict when an upturn will develop. So far as can be seen no betterment is in sight. Yet stocks in the hands of consumers either are entirely absent or low and when a buying movement does set in it is believed it will gather momentum quickly and reach good sized proportions. However, offsetting this view is the contention that the financial condition of consumers is at such a low point that it is difficult to foresee such a development.

Despite their long deferred buying railroads still remain out of the market, partially because of the state of their finances and also because of the comparatively small freight movement.

Pig Iron

Slightly increased orders are being received for carload shipment of foundry iron. Domestic furnace interests insist that \$14. furnace, is the minimum price for No. 2 plain iron. They claim they are getting from 25c. to 50c. per ton over prices paid for foreign material. Another movement of about 6000 tons of Royal Dutch iron is being shipped to this port and is expected to arrive at the end of the month. It is said about 4000 tons has been sold and that the remaining 2000 tons will be stocked. The 6019 tons of iron which was received here from Immingham, England, on June 12 was delivered to a cast iron pipe foundry on the Delaware River.

Plates, Shapes and Bars

Makers have informally announced third quarter prices at the second quarter levels. Small improvement in orders for light jobs has developed in the market for plates and shapes. Railroad and other large purchasers are still out of the market except for minimum and urgent needs. The Panther Valley Water Co., Tamaqua, Pa., is expected to make an award this week for a pipe line project, but it is understood it has not been definitely determined whether it will be cast iron or steel pipe. In the event it is the latter it will require 1700

tons of plates. Bids for the Philadelphia Post Office are expected to be asked next month and will involve about 12,000 tons, while bids likely will be asked in August for the Philadelphia customs house, requiring about 8000 tons.

Sheets

Demand is extremely light. Mills will continue second quarter levels through the third quarter.

A. Leschen & Sons Rope Co. Celebrates 75th Anniversary

A 75TH birthday is being celebrated this year by A. Leschen & Sons Rope Co. of St. Louis. One of the pioneers of the industry, this company started to make wire rope by hand in an open field. Now the plant covers many acres and the hand method has long ago given way to modern machines.

Changes in the nature of wire rope have accompanied the evolution of the various industries using it. Mechanical logging, which was making its appearance in the early 80's, and the increasing use of mechanical dredging caused the introduction, by the company, of its "Hercules" grade,



This artistic poster commemorates 75 years of wire rope making.

Warehouse Business

Jobbers report that demand continues to be light. Such foreign steel as is being sold in this district is largely going at the same warehouse prices as are received for domestic steel.

Imports

Imports at Philadelphia last week included 6019 tons of pig iron from England; 31 tons of silicomanganese from Norway; 81 tons of steel bands from Germany; 10 tons from France and 6 tons from Belgium; 50 tons of flat and round bars from France and 26 tons from Belgium; 14 tons of structural shapes from Belgium.

Scrap

The market is at a standstill and reflects a softer tone.

which was an improvement on the Plow Steel grade previously considered best. Later on, in 1894, the company introduced its flat strand construction. The present line has a wide range; it being the policy of the company to diversify its line for the purpose of providing maximum suitability for specific requirements.

Two Open-Hearths Added at Lackawanna

BUFFALO, June 21.—Pig iron demand is at a minimum. The most sizeable inquiry is one for 300 tons from New England.

Steel

Two open-hearths were added to the number active at Lackawanna plant of the Bethlehem Steel Corp., making five in operation. These will probably continue running the rest of the month. The Republic Steel Corp.'s three open-hearths went down Sunday to be charged again the coming Saturday. The Seneca Iron & Steel Co. is operating at 25 per cent.

Scrap

A mill which recently took an order for breakable cast at around \$6.50 or \$7 a ton is understood to be still in the market. This mill is rapidly cleaning up its old orders of No. 2 heavy melting steel by accepting limited shipments at the present time. Approximately 1000 tons of machine shop turnings which came from Detroit by boat was unloaded at North Tonawanda, transferred to cars and delivered Niagara Falls at a price of around \$5. Offering prices on borings and turnings are now so low that dealers cannot ship.

Steel Sales Decline at Cleveland, But Ingot Output Is Unchanged

No Change in Business Expected Before August—Numerous Industrial Shutdowns Likely in July

CLEVELAND, June 21.—The volume of steel sales in nearly all products has declined, in some instances rather sharply. The steel industry comes up to the beginning of the third quarter and the usually dull mid-summer months with no clear vision as to what the future holds in store. While the opinion is rather general that some improvement may be looked for by August, it is obvious that such an expectation is thus far based on factors having to do with underlying conditions rather than any apparent prospects for larger steel requirements.

Cap Screws

Manufacturers of cap and set screws have adopted new discounts on some items and have established a list and discount basis for consumers, whereas formerly consumers were quoted net prices and jobbers were quoted on the discount basis. The change is expected to stabilize the price situation as affecting consumers. The new discounts to jobbers, which will be found on page 1377, mean lower net prices on some items.

Pig Iron

Sales of pig iron totaled only about 2500 tons the past week, all in scattered small lots for prompt shipment, at unchanged prices. There is virtually no interest in third quarter iron. Shipments are mostly for automotive work and are barely equal this month to those of the corresponding period in May. Many foundries in the district are using a large percentage of scrap, owing to the great differential in price as compared with pig iron. Foundry shutdowns are likely to be quite general throughout July. For local delivery, foundry and malleable iron is still quoted at \$15.50, furnace, while for out-of-town shipments \$14.50 is the maximum quotation, with concessions depending on the freight rate to point of delivery.

Iron Ore

Consumption of Lake ore in May totaled 918,321 tons, compared with 1,039,799 tons in April, a decrease last month of 121,478 tons, according to the report of the Lake Superior Iron Ore Association. In May, 1931, consumption of Lake ore amounted to 2,674,758 tons. Ore on hand at furnaces on June 1 was 27,166,711 tons, which, with 5,533,246 tons on Lake Erie docks, made a total of 32,699,957 tons of ore on hand at the beginning of this month. The number of furnaces using Lake ore in blast on the

last day of May was 52, compared with 55 on the last day of April.

Bars, Plates and Shapes

Bar tonnage is mostly for automotive work. A few small prospects for plates that have long been dormant have come to life. One railroad is tentatively figuring on a large car repair program, but no formal inquiry has appeared. The only large structural steel projects in sight are the Main Street bridge, Cleveland, and the Cleveland post office, each of which will take about 10,000 tons, but bids probably will not be taken until August. Prices are firm at 1.65c. a lb., Cleveland, on bars and 1.60c., Pittsburgh, on shapes and plates.

Sheets

Tonnage in sheets is light, but prices are holding firmly except that a concession of \$2 a ton is being granted

on hot-rolled and hot-rolled annealed to such large consumers as the automobile, barrel and metal lath manufacturers.

Strip

The new prices on hot-rolled strip with a single base for all widths have not yet been tested. Mills are quoting 1.50c., Pittsburgh, for carload lots, 1.55c. for less-than-carloads and 1.45c. to large consumers. Cold-rolled strip remains at 2c., Cleveland.

Rivets

Manufacturers of rivets are sending third quarter contracts to their customers with prices unchanged at \$2.25 per 100 lb., Cleveland, for large rivets and 70, 10 and 5 per cent off list for small rivets.

Scrap

Business is virtually at a standstill. Only an occasional carload is being shipped to out-of-town points, there being no local demand. Prices on some grades are slightly lower, but the actual market is difficult to determine because of the dearth of transactions. Some scrap dealers, having no market for steel grades, have been storing these in steel mill yards to be sold whenever the steel companies may require them.

Birmingham Mill Reports Slight Gain in Bookings

BIRMINGHAM, June 21.—June threatens to be the poorest month of the year from the standpoint of pig iron sales and shipments. Some days there are practically no bookings. Shipments move out irregularly. Foundries generally begin melting the iron as soon as received, so bare are their yard stocks. Furnace operations have been the same for the past four weeks, with four stacks active. Two are on basic and two on foundry. Woodward, the Tennessee company, Sloss-Sheffield and Republic each have a stack in blast.

Steel

A slight increase in new tonnage was reported for last week by one steel manufacturer, but another had only a routine week. Seasonal demand for hay bale ties is usually in full swing at this time, but such business is off and there will not be much tonnage on account of the low price of hay. Some third quarter contracts for sheets and other products are being closed, but advance buying is rather slow. Structural steel and bar fabricators booked nothing of importance last week. Current prices are unchanged and they are also the basis for third quarter business booked at this time. Open-hearth operations are still limited to four active units of the Tennessee company at Fair-

field. Gulf States Steel open-hearths are idle for the third successive week.

Scrap

Inquiries have improved, but buying is still confined to an occasional car. Shipments on contracts are irregular and limited. Prices are unchanged.

St. Louis Scrap Prices Again Decline

ST. LOUIS, June 21.—Specifications against contracts for pig iron, which have been well maintained for some months, have begun to sag. Spot business during the week was confined to a few carloads. Despite the lack of business, prices remain firm and unchanged, makers believing that lower prices would not stimulate business to any extent.

Open-hearth operations continued at about 12 per cent of capacity. Structural fabricating plants in the district are operating at about 15 per cent of capacity. The Municipal Auditorium, 4000 tons, up for bids June 28, is the only sizable project pending.

The sale of 170 carloads and 14 carloads of scrap by the Missouri Pacific and St. Louis Southwestern railroads, respectively, during the week had a further depressing effect on the market here and prices on some items are from 25c. to 75c. a ton lower. Dealers here bought mostly to cover contracts, and some of the scrap went to Kansas City.

Steel Bookings Hold Their Own In New York Territory

Tin Plate Specifications and Miscellaneous Releases Show Improvement—Sporadic Gains in Foundry Melt

NEW YORK, June 21.—Some slight improvement in bookings was experienced by a few steel companies in the past week, but betterment has not been general enough nor pronounced enough to be significant. Sheet specifications were stimulated for a time by a temporary burst of activity among the steel barrel manufacturers. Increased purchases of oil to avoid payment of the tax effective June 21 created an unusually large demand for containers. Tin plate releases are also reported somewhat heavier and are expected to remain in good volume for another month or two. The Gold Dust Corp., New York, has issued an inquiry for 20,000 to 25,000 boxes of tin plate, representing its last half requirements.

The New York Central Lines will open bids June 28 on their third quarter requirements in plates, shapes, bars, billets, axles, tubes, wire nails and staples. An unusual feature of the inquiry for bars, plates and shapes is that the railroad reserves the right to deliver to the steel manufacturers No. 1 heavy melting steel equal in value to the new material purchased. To facilitate this method of payment, bidders are asked to name a scrap price satisfactory to them for the coming quarter.

Pig Iron

Sporadic gains in foundry melt are in evidence. However, the increased activity is still too scattered to be reflected in demand, which continues to lag. That buyers are continuing to adhere rigidly to a hand-to-mouth purchasing policy is clearly indicated by the small volume of current inquiry. Bookings of 1000 tons in the past week compare with 1500 tons in each of the two preceding weeks. In the absence of important tonnage, prices are untested. Pressure to liquidate furnace stocks at one eastern Pennsylvania producing point has caused slight weakness in price in that district. No open break has eventuated, however, and the \$14 base price in that market is being generally maintained.

Reinforcing Bars

With few exceptions new projects involve only negligible quantities of bars. The State of New Jersey is taking bids on a viaduct over South River at Old Bridge, which will require about 165 tons of steel bars. No sizable awards were made in the past week. In the absence of significant tonnages, current prices of 1.60c.,

Pittsburgh, or 1.95c., New York, are untested.

Scrap

This market remains exceedingly quiet. Recent small purchases by a local dealer have established prices of \$8 to \$8.50 for steel car axles and \$3.50 to \$4 for railroad malleable cast. Otherwise the list is nominally unchanged.

New England Market Remains Sluggish

BOSTON, June 21.—With the New England melt of pig iron now down to less than 10 per cent of rated capacity, furnace representatives had little opportunity to do business the past week. Sales were again confined to a few scattered carlots and aggregated not more than 300 tons, including a small lot of Indian iron. Prices are being maintained, despite the lack of buying. There is nothing to indicate any improvement in business the remainder of this month.

Scrap

More activity in rails for rerolling within the near future is indicated. Local brokers are negotiating with a Massachusetts traction company for a round tonnage, and final papers presumably will be passed on other tonnages. Stocks of such rails in dealers' hands are sizable, and New England, New York and Pennsylvania rollers are placing no orders; consequently prices are easier on a basis of \$5.50 to \$6 a ton, delivered, and \$4.50 to \$5 a ton, on cars shipping point. The scrap market otherwise is still in the doldrums.

Decision on Imported Bars Expected to be Reaffirmed

WASHINGTON, June 21.—Reaffirmation of its decision holding that imported reinforcing bars must be marked with the country of origin is expected to be announced soon by the Bureau of Customs. It is understood that the bureau has taken the position that domestic producers have made a completely convincing case to sustain their contention that the bars can be marked, since American-made bars are marked and that where this

is possible the tariff act requires that it be done.

The bureau extended the time of application of the decision so that it will become effective July 14 and is said to have heard additional arguments by representatives of importing interests. However, announcement that the original decision will stand as to marking is looked for soon.

Capacities in Pig Iron and Steel Making

The survey of capacities for pig iron, ferroalloys and steel ingots, made annually by the American Iron and Steel Institute, has now been completed and shows the following results:

Capacities in Gross Tons		
	Dec. 31, 1930	Dec. 31, 1931
Pig iron.....	51,850,775	50,937,775
Ferroalloys*	809,100	802,400
Total	52,659,875	51,740,175
Steel Ingots:		
Basic open-hearth ..	57,071,880	58,505,640
Acid open-hearth ..	927,690	897,990
Bessemer	8,070,000	8,070,000
Electric	801,940	805,240
Crucible	25,586	20,086
Total	66,897,096	68,298,956

* Annual capacity of blast furnaces only.

Pig iron capacity shows a reduction in the year of 1 3/4 per cent, while steel ingot capacity increased by about 2.1 per cent, in the face of losses in acid open-hearth and crucible steel-making facilities. The net increase of 1,402,000 tons in the steel-making capacity is registered against the completion last year, as shown in THE IRON AGE survey of Jan. 7, of new furnaces having an annual capacity of 4,075,000 tons, so that old plant in excess of 2,600,000 tons has been replaced, abandoned and otherwise written off the records.

Steel and Wire Company Operates Duluth Plant

The Minnesota Steel Co., the subsidiary of the United States Steel Corp., which has a wire and bar plant at Morgan Park, Duluth, is now constituted as a holding company after the fashion of the Indiana Steel Co., of the Steel Corporation, and the works is being operated under lease by the American Steel & Wire Co. L. C. Reis retains his connection with the Minnesota company but is also general manager of operations of the plant.

Railroad Equipment

Shipments of railroad locomotives in May totaled 15 units, 13 being of steam and two of the electric type. All were for domestic account. April shipments totaled only eight locomotives, according to the Bureau of the Census. Unfilled orders at the end of May decreased to 147 units as against 162 at the end of April. Shipments in the first five months of 1932 declined to 32 from 83 and 336 respectively in the corresponding periods of 1931 and 1930.

Lower Rates to Minnesota Opposed by Omaha, Neb.

WASHINGTON, June 21.—The proposal of railroads to reduce rates on iron and steel from Chicago and St. Louis to St. Paul, Minneapolis and Duluth, Minn., is protested in a brief filed by the Chamber of Commerce of Omaha unless similar reductions are made to Omaha.

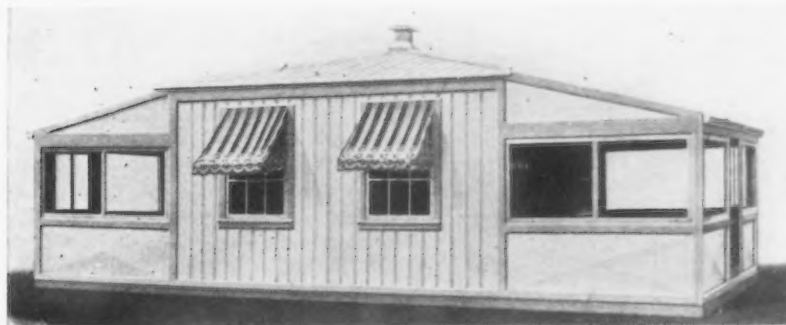
The brief points out that uniform levels, fixing rates on iron and steel at 32½ per cent of first class throughout Western Trunk Line territory, were prescribed by the Interstate Commerce Commission in its decision in the Western Trunk Line case, effective Dec. 3, 1931. It is explained that the carriers now propose to reduce rates on iron and steel in carloads from Chicago to St. Paul-Minneapolis from 41c. per 100 lb. to 28c.; from Chicago to Duluth from 43c. to 30c. and from St. Louis to St. Paul-Minneapolis from 46c. to 30c. and from St. Louis to Duluth from 52c. to 36c.

The reasons assigned for the proposed reductions are motor truck competition, Lake boat competition and Federal barge line competition. The brief says that motor truck competition at Omaha is just as much of a menace to the rail lines as it is at the Twin Cities and Duluth. The reductions, it is claimed, would place Omaha manufacturers, wholesalers and consumers of iron and steel at a disadvantage in favor of those in the Twin Cities and Duluth.

Quickly Erected Factory-Built Steel House

PORTABLE, quickly erected, steel domiciles, fabricated in sections in the factory, are being marketed by the Columbian Steel Tank Co., Kansas City, Mo. The development was an answer to demands for summer homes in the Ozark Mountains. The houses are now reported proving popular as permanent dwellings in suburban districts. Real estate developers have sold the house and a lot for \$1,000.

Rolled steel sheets on the exterior



Factory-built house of steel is erected on the site ready for occupancy in one day at a cost, including lot, of \$1,000.

walls and roof are supported by a structural steel frame. The interior is lined with an insulating material forming the interior surfaces. Factory-formed steel plates serve as window and door frames. The house is designed with a standard base unit 16 ft. square to which standardized additions half that size may be made. The roof, of the hip type, rising to a point in the center from the four sides, is shipped in four pieces.

Scrap Specifications to Be Revised by Committee

A standing committee for the revision of scrap iron specifications has been appointed by the Department of Commerce. W. W. MacMillen, representing the National Association of Purchasing Agents, is chairman. This committee was authorized at the scrap revision conference, held in Washington last March, during the annual convention of the Institute of Scrap Iron and Steel. The standing committee will consider the many suggestions made by producers, consumers and scrap dealers at the Washington conference, for the simplification of scrap iron specifications, and will also adopt specifications to cover the complications arising from the presence of alloy steel scrap.

The standing committee, in addition to Mr. MacMillen, consists of the following: E. G. Howell, Chicago, representing the Institute of Scrap Iron and Steel; W. W. Kerlin, Cleveland, representing the Gray Iron Institute; Robert F. Rentschler, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., representing Steel Founders Society of America; Harry R. DeGroat, Philadelphia, representing the National Association of Waste Material Dealers; C. E. Tobey, Lehigh Valley Railroad, representing the American Railway Association.

Railroads May Charge for Crane Service

WASHINGTON, June 21.—Railroads no longer will be permitted to perform free crane service for shippers if the Interstate Commerce Commis-

sion approves a recommendation of Examiner O. L. Mohundro. In a proposed report announced last Wednesday, the examiner found justified proposals of railroads in Official Classification to make a uniform charge of 50c. a ton, minimum \$5 per shipment, for loading and unloading services by means of cranes and other such equipment. The charge would apply at all stations where crane service is maintained or furnished. The free crane service practices did not apply to New England lines. The examiner also held that proposals of the Pennsylvania to institute three rules covering the use of cranes and other facilities should be cancelled without prejudice to the filing of schedules conforming to those proposed by other carriers charging a minimum of \$5 per shipment.

The proceeding covers a portion of broad investigations undertaken by the Commission regarding so-called wasteful practices of the carriers engaged in in order to get traffic from competing lines. The inquiry disclosed that the cost of crane service to railroads in loading and unloading amounted to as much as 46 per cent of the gross revenue from the traffic. Instances of high costs in handling structural steel and stone were emphasized in the report.

Reinforcing Steel

Awards 1000 Tons—New Projects 1975 Tons

AWARDS

- Boston, 100 tons, city health unit, to Truscon Steel Co.
- Annapolis, Md., 250 tons, South River bridge, to Maryland Steel Products Co.
- Ocean City, N. J., 250 tons, bridge, to Kalman Steel Co.
- Seneca, Ill., 140 tons, bridge, to an unnamed bidder.
- Tombstone, Ariz., 124 tons, State highway structures, to Pacific Coast Steel Co.
- San Juan County, N. M., 140 tons, State highway bridges, to Colorado Builders & Supply Co.

NEW REINFORCING BAR PROJECTS

- State of New Jersey, 165 tons, viaduct over South River, Old Bridge.
- Washington, 2200 tons, extensible building for Department of Agriculture; Aronberg-Fried Co., New York, general contractor.
- Washington, 2000 tons, Department of Justice building; Fuller Construction Co., New York, general contractor.
- Fayetteville, Ark., 600 tons, Veterans' Hospital; bids opened June 21.
- Zion Park, Utah, 102 tons, Federal highway construction; bids close June 27.
- Los Angeles County, Cal., 370 tons, structures on State highway between Barranca and Pomona; bids close July 6.
- San Diego County, Cal., 113 tons, State highway bridges in Rose Canyon; bids close July 6.
- Marin Meadows, Cal., 600 tons, Hamilton Field bombing base structures; bids opened June 20.

The Iron Age, June 23, 1932—1375

Copper Bookings for Export Improve; Other Markets Inactive; Prices Firm

NEW YORK, June 21.—Demand from abroad for electrolytic copper experienced a relatively sharp spurt in the past week, when total sales of 2500 tons equaled the volume of export bookings in the two preceding weeks. Most of this business was transacted at the special price of 5.50c., c.i.f. usual European ports. The domestic market, on the other hand, remains vigorous. Despite the dearth of business, however, neither primary producers nor custom smelters are disposed to shade the current quotation of 5½c., delivered Connecticut, for prompt metal. For fourth quarter delivery a premium of ¼c. a lb. is being posted. Although the copper tariff, which became effective today, has engendered a somewhat broader interest among American consumers, lack of other constructive influences tends to obscure the immediate outlook in the industry. Current interest is largely concerned with the possible effect of the tariff on copper prices, and while an advance is considered likely to ensue as an indirect result of the duty, significant upward

fluctuations in prices will probably have to await improved industrial activity. In anticipation of the tariff, Chilean and Canadian producers are understood to have accumulated sizable stocks of copper at various distributing points in the United States. Stocks of Canadian metal in this country are said to approximate 40,000 tons.

Tin

Both the New York and London markets were featureless throughout the past week. Domestic demand for either prompt or future tin is apathetic, and the current volume of bookings is exceedingly light. The New York price of tin, however, has remained fairly steady, with today's market 19.50c. a lb. The London market today was £113 15s. a ton for spot standard, £116 for future standard and £118 5s. for spot Straits. Today's market in the East was £120 10s. Warehouse stocks of tin in the United Kingdom dropped 77 tons last week to a total of 33,139 tons.

Lead

Although demand from the principal consumers is light, a moderate amount of steady buying by miscellaneous users continues to keep this market on an even keel. With practically all consumers covered for their June needs, current business is mainly for July delivery, nearly two-thirds of consumer requirements having already been covered for that month. The steadiness that has characterized the lead market for the past several months may be clearly defined by the fact that current prices of 2.90c., St. Louis, and 3c., New York, have remained stationary since March 22. Domestic stocks of refined lead at the close of May were 174,000 tons, representing a gain of about 4500 tons over stocks at the end of April. Production last month was 28,800 tons, compared with 26,400 tons in April, while shipments in May fell off to 24,300 tons from 26,100 tons in April.

Zinc

The expected advance in the price of zinc ore in the Joplin district failed to materialize last week. Although current ore production is down to about 700 tons a week, stocks above ground are still in large proportion, and until a good part of this surplus is liquidated, the strong position of the zinc ore market is not considered likely to influence the price of Prime Western zinc, which is unchanged at 2.80c., East St. Louis, and 3.17c., New York. Current interest in zinc, particularly for forward delivery, is at the low point for this year.

The Week's Prices. Cents Per Pound for Early Delivery

	June 15	June 16	June 17	June 18	June 20	June 21
Lake copper, New York.....	5.50	5.50	5.50	5.50	5.50	5.50
Electrolytic copper, N. Y.*.....	5.12½	5.12½	5.12½	5.12½	5.12½	5.12½
Straits tin, spot, N. Y.	19.25	19.12½	19.50	19.40	19.40	19.50
Zinc, East St. Louis.....	2.80	2.80	2.80	2.80	2.80	2.80
Zinc, New York.....	3.17	3.17	3.17	3.17	3.17	3.17
Lead, St. Louis.....	2.90	2.90	2.90	2.90	2.90	2.90
Lead, New York.....	3.00	3.00	3.00	3.00	3.00	3.00

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.
Aluminum, 98 to 99 per cent pure, 22.90c. a lb., delivered.
Nickel, electrolytic cathode, 35c. a lb., delivered; shot and ingot, 36c. a lb., delivered.
Antimony, 5.12½c. a lb., New York.
Brass ingots, 85-5-5-5, 6.00c. a lb., New York and Philadelphia.

From New York, Warehouse Delivered Prices, Base per Lb.

Tin, Straits pig.....	21.50c. to 22.50c.
Tin, bar.....	23.50c. to 25.50c.
Copper, Lake.....	7.50c. to 8.50c.
Copper, electrolytic.....	7.25c. to 8.25c.
Copper, casting.....	7.00c. to 8.00c.
*Copper sheets, hot-rolled.....	14.87½c.
*High brass sheets.....	12.00c.
*Seamless brass tubes.....	15.25c.
*Seamless copper tubes.....	14.37½c.
*Brass rods.....	9.75c.
Zinc, slabs.....	4.25c. to 4.75c.
Zinc sheets (No. 9), casks.....	9.25c. to 9.50c.
Lead, American pig.....	4.00c. to 4.50c.
Lead, bar.....	5.75c. to 6.75c.
Lead sheets.....	7.50c.
Antimony, Asiatic.....	8.00c. to 9.00c.
Alum., virgin, 99 per cent plus.....	23.30c.
Alum. No. 1 for remelting, 98 to 99 per cent.....	16.00c. to 17.00c.
Solder, ½ and ½.....	14.75c. to 15.75c.
Babbitt metal, commercial grade.....	18.00c. to 28.00c.

*These prices are also for delivery from Chicago and Cleveland warehouses.

Metals from Cleveland Warehouse Delivered Prices per Lb.

Tin, Straits pig.....	24.00c.
Tin, bar.....	26.00c.

Copper, Lake.....	6.50c.
Copper, electrolytic.....	6.50c.
Copper, casting.....	6.25c.
Zinc, slab.....	4.25c. to 4.50c.
Lead, American pig.....	3.75c. to 4.00c.
Lead, bar.....	7.25c.
Antimony, Asiatic.....	9.50c.
Babbitt metal, medium grade.....	14.50c.
Babbitt metal, high grade.....	28.00c.
Solder, ½ and ½.....	16.00c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible.....	4.00c.	4.50c.
Copper, hvy. and wire.....	3.75c.	4.25c.
Copper, light and bottoms.....	2.875c.	3.625c.
Brass, heavy.....	1.75c.	2.25c.
Brass, light.....	1.25c.	1.75c.
Hvy. machine composition.....	2.75c.	3.25c.
No. 1 yel. brass turnings.....	2.00c.	2.50c.
No. 1 red brass or compos. turnings.....	2.50c.	3.00c.
Lead, heavy.....	2.00c.	2.50c.
Zinc.....	1.00c.	1.375c.
Cast aluminum.....	2.50c.	4.00c.
Sheet aluminum.....	6.50c.	8.00c.

Large Government Order for Trucks

The Post Office Department has placed an order for 435 trucks, costing about \$1,500,000, with the White Motor Co., Cleveland.

"Stereoscopic Metallurgy" was the topic for the June meeting of the Golden Gate chapter of the American Society for Steel Treating, held at the Richelieu Hotel, San Francisco, June 20. George A. Nelson, metallurgist, was the speaker and his talk was illustrated by photomicrographs projected on the screen in three dimensions.

Prices of Finished and Semi-Finished Steel, Coke, Coal, Cast Iron Pipe

BARS, PLATES, SHAPES

Iron and Steel Bars

Soft Steel	Base per Lb.
F.o.b. Pittsburgh mill	1.60c.
F.o.b. Chicago	1.70c.
Del'd Philadelphia	1.91c.
Del'd New York	1.95c.
Del'd Detroit	1.80c.
F.o.b. Cleveland	1.65c.
F.o.b. Lackawanna	1.70c.
F.o.b. Birmingham	1.75c.
C.I.F. Pacific ports	2.10c.

Billet Steel Reinforcing

F.o.b. P'gh mills, 40, 50, 60-ft.	1.60c.
F.o.b. Birmingham, mill lengths	1.75c.
F.o.b. Cleveland	1.50c.

Rail Steel

F.o.b. mills, east of Chicago dist	1.20c.
F.o.b. Chicago Heights mills	1.50c.

Iron

Common iron, f.o.b. Chicago	1.65c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.11c.
Common iron, del'd New York	2.15c.

Tank Plates

Base per Lb.	
F.o.b. Pittsburgh mill	1.60c.
F.o.b. Chicago	1.70c.
F.o.b. Birmingham	1.75c.
Del'd Cleveland	1.8035c.
Del'd Philadelphia	1.7935c.
F.o.b. Coatesville	1.70c.
F.o.b. Sparrows Point	1.70c.
F.o.b. Lackawanna	1.70c.
Del'd New York	1.8985c.
C.I.F. Pacific ports	2.00c.

Structural Shapes

Base per Lb.	
F.o.b. Pittsburgh mill	1.60c.
F.o.b. Chicago	1.70c.
F.o.b. Birmingham	1.75c.
F.o.b. Lackawanna	1.70c.
F.o.b. Bethlehem	1.70c.
Del'd Cleveland	1.8035c.
Del'd Philadelphia	1.7935c.
Del'd New York	1.86775c.
C.I.F. Pacific ports (standard)	2.10c.
C.I.F. Pacific ports (wide flange)	2.20c.

Steel Sheet Piling

Base per Lb.	
F.o.b. Pittsburgh	1.90c.
F.o.b. Chicago mill	2.05c.
F.o.b. Buffalo	2.00c.

Alloy Steel Bars

(F.o.b. maker's mill)

Alloy Quantity Bar Base, 2.65c. per Lb.	Alloy Series	Differential per 100 Lb.
2000 (1 1/2% Nickel)	0.25	
2100 (1 1/2% Nickel)	0.55	
2200 (3% Nickel)	1.50	
2500 (5% Nickel)	2.25	
3100 Nickel Chromium	0.55	
3200 Nickel Chromium	1.35	
3300 Nickel Chromium	3.80	
3400 Nickel Chromium	3.20	
4100 Chromium Molybdenum (0.16 to 0.25 Molybdenum)	0.50	
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70	
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.50 to 2.00 Nickel)	1.05	
5100 Chromium Steel (0.60 to 0.90 Chromium)	0.35	
5100 Chromium Steel (0.80 to 1.10 Chromium)	0.45	
5100 Chromium Spring Steel	0.20	
6100 Chromium Vanadium Bar	1.20	
6100 Chromium Vanadium Spring Steel	0.95	
9250 Silicon Manganese Spring Steel (flats)	0.25	
Rounds and Squares	0.50	
Chromium Nickel Vanadium	1.50	
Carbon Vanadium	0.95	

Above prices are for hot-rolled steel bars, forging quality. The differential for cold-drawn bars is 3/4c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a section area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2 1/2 in. thick, regardless of sectional area, take the bar price.

Cold Finished Bars*

Base per Lb.	
Bars, f.o.b. Pittsburgh mill	1.70c.
Bars, f.o.b. Chicago	1.70c.
Bars, Cleveland	1.70c.
Bars, Buffalo	1.70c.
Shafting, ground, f.o.b. mill	1.70c.
	12.05c. to 3.00c.

*In quantities of 10,000 lb. or more.
†According to size.

SHEETS, STRIP, TIN PLATE, TERNE PLATE

Sheets

Hot-rolled	Base per Lb.
No. 10 f.o.b. Pittsburgh	1.55c.
No. 10 f.o.b. Chicago mill	1.65c.
No. 10 del'd Philadelphia	1.86c.
No. 10 f.o.b. Birmingham	1.70c.
No. 10, c.i.f. Pacific Coast ports	2.17 1/2c.

Hot-rolled and Annealed

No. 10, Pittsburgh	1.70c.
No. 10, Chicago mills	1.80c.
No. 10, Birmingham	1.85c.
No. 10, Pacific Coast ports	2.32 1/2c.

Hot-Rolled Annealed

No. 24, f.o.b. Pittsburgh	2.20c.
No. 24, f.o.b. Chicago mills	2.30c.
No. 24, del'd Philadelphia	2.46c. to 2.51c.
No. 24, f.o.b. Birmingham	2.35c.
No. 24, c.i.f. Pacific Coast ports	2.85c.

Heavy Cold-Rolled

No. 10 gage, f.o.b. Pittsburgh	2.25c.
No. 10 gage, f.o.b. Chicago mills	2.35c.
No. 10 gage, del'd Philadelphia	2.46c.

Light Cold-Rolled

No. 20 gage, f.o.b. Pittsburgh	2.70c.
No. 20 gage, f.o.b. Chicago mills	2.85c.
No. 20 gage, del'd Philadelphia	3.06c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh	2.85c. to 2.90c.
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Steel Furniture Sheets

No. 10, f.o.b. Pittsburgh	2.45c.
No. 20, f.o.b. Pittsburgh	3.15c.

(Prices on furniture stock include stretcher leveling but not resquaring.)

Galvanized Sheets

No. 24, f.o.b. Pittsburgh	2.85c.
No. 24, f.o.b. Chicago mills	2.95c.
No. 24, del'd Philadelphia	3.16c.
No. 24, f.o.b. Birmingham	3.00c.
No. 24, c.i.f. Pacific Coast ports	3.50c.

Long Ternes

No. 24, unassorted, 8-lb. coating, f.o.b. P'gh	2.80c. to 3.00c.
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Vitreous Enameling Stock

No. 10, f.o.b. Pittsburgh	2.50c. to 2.60c.
No. 20, f.o.b. Pittsburgh	3.00c. to 3.10c.

Tin Mill Black Plate

No. 28 f.o.b. Pittsburgh	2.40c.
No. 28 Chicago mill	2.50c.

Tin Plate

Base per Box	
Standard cokes, f.o.b. P'gh district mill	\$4.75
Standard cokes, f.o.b. Gary	4.85

Terne Plate

(F.o.b. Morgantown or Pittsburgh) (Per Package, 20 x 28 in.)	
8-lb. coating I.C.	\$9.50
15-lb. coating I.C.	12.00
20-lb. coating I.C.	13.00
25-lb. coating I.C.	14.10
30-lb. coating I.C.	14.90
40-lb. coating I.C.	16.70

Hot-rolled Hoops, Bands and Strips

Base per Lb.	
6 in. and narrower, Pittsburgh	1.50c. to 1.60c.
Wider than 6 in. P'gh	1.40c. to 1.50c.
6 in. and narrower, Chicago	1.60c. to 1.70c.
Wider than 6 in. Chicago	1.50c. to 1.60c.
Cooperage stock, P'gh	1.60c. to 1.70c.
Cooperage stock, Chicago	1.70c. to 1.80c.

Cold-Rolled Strips

F.o.b. Pittsburgh	2.00c.
F.o.b. Cleveland	2.00c.
Del'd Chicago	2.30c.
F.o.b. Worcester	2.20c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland	2.90c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland)

(After Dec. 31, extras of 10c. a 100 lb. on mixed and joint carloads, 25c. on pool carloads and 40c. on less than carloads will be applied on all merchant wire products.)

To Manufacturing Trade

Bright wire	2.20c.
Spring wire	3.20c.

To Jobbing Trade

Base per Keg	
Standard wire nails	\$1.95
Smooth coated nails	1.95
Galvanized nails	3.95
Base per Lb.	
Smooth annealed wire	2.35c.
Smooth galvanized wire	2.80c.
Polished staples	2.50c.
Galvanized staples	2.75c.

Barbed wire, galvanized.....2.00c.
Woven wire fence No. 9 gage, per net ton.....\$25.00
Woven wire fence, No. 12 1/2 gage and lighter, per net ton.....60.00
Chicago and Anderson, Ind., mill prices are \$1 a ton over Pittsburgh base; Duluth, Minn., and Worcester, Mass., mill \$2 a ton over Pittsburgh, and Birmingham mill \$3 a ton over Pittsburgh.

STEEL PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Steel	Iron
Inches Black Galv.	Inches Black Galv.
1/8.....47 21 1/2	1/8 and 3/8 + 9 + 3 1/2
1/4 to 3/8.....53 27 1/2	1/4.....25 7
1/2.....58 44 1/2	1/2.....30 13
3/4.....62 50 1/2	3/4 and 1 1/4 33 17
1 to 3.....64 52 1/2	1 1/2 and 2 3/4 37 20

Lap Weld	
2.....57 45 1/2	2.....25 11
2 1/2 to 4.....61 49 1/2	2 1/2 to 3 1/2 30 15
4 and 5.....58 45 1/2	4 to 6.....32 19
6 and 8.....62 50 1/2	7 and 8.....31 18
11 and 12 55 42 1/2	9 to 12.....28 13

Butt Weld, extra strong, plain ends	
1/8 to 3/8.....43 26 1/2	1/4 and 3/4 + 11 + 4 1/2
1/2 to 3/4.....55 44 1/2	1/2.....25 9
3/4.....60 49 1/2	3/4.....30 14
1 to 1 1/2.....62 50 1/2	1 to 2.....36 20
2 to 3.....63 52 1/2	

Lap Weld, extra strong, plain ends	
2.....55 44 1/2	2.....31 15
2 1/2 to 4.....59 48 1/2	2 1/2 to 4 36 22
4 1/2 to 6.....62 50 1/2	4 1/2 to 6 35 21
7 to 8.....54 41 1/2	7 and 8.....33 19
9 and 10 47 34 1/2	9 to 12.....23 10
11 and 12 46 33 1/2	

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discounts of 5 and 2 1/2% and on galvanized by 1 1/2 points with supplementary discounts of 5 and 2 1/2%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discounts of 5 and 2 1/2%.

Note—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2 1/2 points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel	Cast Iron
2 in. and 2 1/2.....1 1/2 in.	1 1/2 in. 1
3 in. 38	1 3/4 in. 8
2 1/2 in.—2 3/4 in. 46	2 in.—2 1/4 in. 13
3 in. 52	2 1/2 in.—2 3/4 in. 14
3 1/2 in.—3 3/4 in. 54	3 in. 17
4 in. 57	3 1/2 in. to 3 3/4 18
4 1/2 in. to 6 in. 46	4 in. 20
	4 1/2 in. 21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes	
Cold-Drawn	
1 in. 61	3 in. 45
1 1/4 to 1 1/2 in. 53	3 1/2 to 3 3/4 in. 48
1 3/4 in. 37	4 in. 51
2 to 2 1/4 in. 32	4 1/2, 5 and 6 in. 49
2 1/2 to 2 3/4 in. 40	

Hot Rolled	
2 and 2 1/4 in. 38	3 1/4 to 3 3/4 in. 54
2 1/2 and 2 3/4 in. 46	4 in. 57
3 in. 52	4 1/2, 5 and 6 in. 49

Beyond the above base discounts a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. in lighter than standard gages takes the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

Per Cent Off List	
Carbon, 0.10% to 0.30% base (carloads)	55
Carbon, 0.30% to 0.40% base	50
Plus differential for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.	

RAILS AND TRACK SUPPLIES

Rails

Per Gross Ton	
Standard, f.o.b. mill	\$43.00
Light (from billets), f.o.b. mill	32.00
Light (from rail steel, f.o.b. mill)	\$28.00 to 30.00

Track Equipment

Base per 100 Lb.	
Spikes, 9/16-in. and larger	\$2.60
Spikes, 1/2-in. and larger	2.60
Spikes, boat and barge	2.80
Tie plate, steel	1.85
Angle bars	2.75
Track bolts, to steam railroads	3.50
Track bolts, to jobbers, all sizes, per 100 count	73 per cent off list

BOLTS, NUTS, RIVETS AND SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Per Cent Off List	
Machine bolts	75
Carriage bolts	75
Lag bolts	75
Flw bolts, Nos. 1, 2, 3 and 7 heads	75
Hot-pressed nuts, blank or tapped, square	75
Hot-pressed nuts, blank or tapped, hexagonal	75
C.p.c. and square or hex. nuts, blank or tapped	75
Washers* 7/16 to 6 7/8 in. per lb. off list	

*F.o.b. Chicago, New York and Pittsburgh.
*Bolts with rolled thread up to and including 1/2 in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

Per Cent Off List	
Semi-finished hexagon nuts	75
Semi-finished hexagon castellated nuts	75
S.A.E. bolts in packages, P'gh	75, 25 and 10
Stove bolts in packages, Chicago	75, 25 and 10
Stove bolts in pkgs., Cleveland	75, 25 and 10
Stove bolts in bulk, P'gh	75, 25 and 10
Stove bolts in bulk, Chicago	86
Stove bolts in bulk, Cleveland	86
Tire bolts	40 and 10

Discount of 75 per cent off on bolts and nuts applies on carload business with jobbers and large consumers.

Large Rivets

Base per Lb.	
F.o.b. Pittsburgh or Cleveland	\$4.25
F.o.b. Chicago	70, 10 and 5

Small Rivets

Per Cent Off List	
F.o.b. Pittsburgh	70, 10 and 5
F.o.b. Cleveland	70, 10 and 5
F.o.b. Chicago	70, 10 and 5

Cap and Set Screws

Discounts to Jobbers
(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

Per Cent Off List	
Milled cap screws	80 and 25
Milled standard set screws, case hardened	75 and 10
Milled headless set screws, cut thread	75 and 10
Upset hex. head cap screws, U.S.S.	80, 25 and 10
Upset set screws, sq. head, 1 in. and smaller	75, 10 and 10
Upset set screws, 1 1/4 in. and larger	75 and 10
Milled studs	75 and 10

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(F.o.b. Pittsburgh or Youngstown)	
Grooved	Per Lb.
Universal	1.60c.
Sheared	1.60c.

Wire Rods	
(Common soft, base)	
Pittsburgh	Per Gross Ton
Cleveland	\$37.00
Chicago	38.00

COKE, COAL AND FUEL OIL

Coke	
Per Net Ton	
Furnace, f.o.b. Connellsville	\$2.00 to \$2.15
Foundry, f.o.b. Connellsville	3.00 to 4.25
Foundry, by-product, Chicago	7.00
Foundry, by-product, New England, delivered	10.00
Foundry, by-product, Newark or Jersey City, del'd	8.35 to 8.75
Foundry, by-product, Phila.	9.00
Foundry, by-product, Cleveland, delivered	7.82
Foundry, Birmingham	5.00
Foundry, by-products, St. Louis, f.o.b., ovens	8.00
Foundry, by-products, del'd St. Louis	9.00

Coal	
Per Net Ton	
Mine run steam coal, f.o.b. W. Pa. mines	\$1.40 to \$1.50
Mine run coking coal, f.o.b. W. Pa.	1.50 to 1.60
Gas coal, 1/2-in. f.o.b. Pa. mines	1.70 to 1.80
Mine run gas coal, f.o.b. Pa. mines	1.50 to 1.60
Steam slack, f.o.b. W. Pa. mines	0.50 to 0.65
Gas slack, f.o.b. W. Pa. mines	0.50 to 0.65

Fuel Oil	
Per Gal. f.o.b. Bayonne, N. J.	
No. 3 distillate	4.00c.
No. 4 industrial	3.50c.
Per Gal. f.o.b. Baltimore	
No. 3 distillate	3.50c.
No. 4 industrial	3.25c.
Per Gal. del'd Chicago	
No. 3 industrial fuel oil	2.65c.
No. 5 industrial fuel oil	2.45c.
Per Gal. f.o.b. Cleveland	
No. 3 industrial fuel oil	4.62 1/2c.
No. 4 distillate	3.87 1/2c.

REFRACTORIES

Fire Clay Brick	
Per 1000 f.o.b. Works	
High-heat	Intermediate
Duty Brick	Duty Brick
Penn.	\$35.00 \$25.00 to \$30.00
Maryland	35.00 25.00 to 30.00
New Jer.	\$44.00 to 57.00
Ohio	35.00 25.00 to 30.00
Kentucky	35.00 25.00 to 30.00
Missouri	35.00 25.00 to 30.00
Illinois	35.00 25.00 to 30.00
Ground fire clay, per ton	6.50

Chrome Brick	
Per Net Ton	
Standard size	\$42.50

Silica Brick	
Per 1000 f.o.b. Works	
Pennsylvania	\$38.00
Chicago	47.00
Birmingham	50.00
Silica clay, per ton	8.0

Magnesite Brick	
Per Net Ton	
Standard sizes, f.o.b. Baltimore and Chester, Pa.	\$61.50
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	38.50
Domestic, f.o.b. Chewelah, Wash.	20.90

CAST IRON PIPE

Per Net Ton	
6-in. and larger, del'd Chicago	\$36.40 to \$38.40
4-in., del'd Chicago	39.40 to 41.40
26-in. and larger, del'd New York	28.20
4-in., del'd New York	31.20
6-in. and larger, Birm'ham	\$32.00 to 33.00
4-in., Birm'ham	35.00 to 36.00
Class "A" and gas pipe, \$3 extra.	

Pig Iron, Ores, Ferroalloys

VALLEY	
Per gross ton, f.o.b. Valley furnace:	
Basic	\$14.00
Bessemer	15.00
Gray forge	14.50
No. 2 foundry	14.50
No. 3 foundry	14.00
Malleable	15.00
Low phos., copper free	25.00

Freight rate to Pittsburgh or Cleveland district, \$1.82.

PITTSBURGH	
Per gross ton, f.o.b. Pittsburgh district furnace:	
Basic	\$14.50
No. 2 foundry	15.50
No. 3 foundry	15.00
Malleable	15.50
Bessemer	15.50

Freight rates to points in Pittsburgh district range from 80c. to \$1.26.

CHICAGO	
Per gross ton at Chicago furnace:	
N'th'n No. 2 fdy.	\$16.00
N'th'n No. 1 fdy.	16.50
Malleable, not over 2.25 sil.	16.00
High phosphorus	16.00
Lake Super. charcoal, sil.	16.14
1.50, by rail	23.17
Southern No. 2 fdy.	16.14
Low phos., sil. 1 to 2, copper free	27.50
Silvery, sil. 8 per cent.	23.67
Bess. ferroil'n, 15 per cent	28.92

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnaces, not including a switching charge.

ST. LOUIS	
Per gross ton at St. Louis:	
No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill.	\$17.50
Malleable, f.o.b. Granite City	17.50
Northern No. 2 fdy., del'd St. Louis	\$18.30 to 18.80
Southern No. 2 fdy., del'd St. Louis	14.56
Northern malleable, del'd St. Louis	18.30 to 18.80
Northern basic, del'd St. Louis	18.30 to 18.80

Freight rates 83c. (average) Granite City to St. Louis; \$2.30 from Chicago; \$4.56 from Birmingham.

NEW YORK	
Per gross ton, delivered New York district:	
*Buffalo, No. 2, del'd east.	
N. J.	\$17.41 to \$17.66
East Pa. No. 2 fdy.	15.52
East Pa. No. 2X fdy.	16.02

Freight rates: \$1.52 to \$2.63 from eastern Pennsylvania.
*Prices delivered to New Jersey cities having rate of \$3.41 a ton from Buffalo.

BUFFALO	
Per gross ton, f.o.b. furnace:	
No. 2 fdy.	\$16.00
No. 2X fdy.	16.50
No. 1 fdy.	17.50
Malleable, sil. up to 2.25	16.50
Basic	15.50
Lake Superior charcoal, del'd	23.41

NEW ENGLAND	
Per gross ton delivered to most New England points:	
*Buffalo, sil.	1.75 to 2.25, \$19.54 to \$20.04
*Buffalo, sil.	2.25 to 2.75, \$19.54 to \$20.04
*Ala., sil. 1.75 to 2.25	19.74
*Ala., sil. 2.25 to 2.75	20.24
*Ala., sil. 1.75 to 2.25	15.88
*Ala., sil. 2.25 to 2.75	16.28

Freight rates: \$5.04 all rail from Buffalo; \$9.75 all rail from Alabama and \$5.88 rail and water from Alabama to New England seaboard.
*All rail rate.
†Rail and water rate.

CINCINNATI	
Per gross ton, delivered Cincinnati:	
Ala. fdy., sil. 1.75 to 2.25	\$13.82
Ala. fdy., sil. 2.25 to 2.75	14.32
Tenn. fdy., sil. 1.75 to 2.25	13.82
N'th'n No. 2 foundry	\$17.01 to 17.59
S'th'n Ohio silvery, 8%	21.02

Freight rates, \$2.02 from Ironton and Jackson, Ohio; \$3.82 from Birmingham.

PHILADELPHIA	
Per gross ton at Philadelphia:	
East Pa. No. 2	\$14.81
East Pa. No. 2X	15.31
East Pa. No. 1X	15.81
Basic (del'd east. Pa.)	16.00
Malleable	\$18.00 to 18.50
Stand. low phos. (f.o.b. east. Pa. furnace)	22.00 to 23.00
Cop. b'r'g low phos. (f.o.b. furnace)	22.00 to 22.50

Va. No. 2 plain	22.04
Va. No. 2X	22.54

Prices, except as specified otherwise, are del'd'd Philadelphia. Freight rates: 84c. to \$1.79 from eastern Pennsylvania furnaces; \$4.67 from Virginia furnaces.

CLEVELAND	
Per gross ton at Cleveland furnace:	
N'th'n No. 2 fdy. (local delivery)	\$15.50
N'th'n fdy., sil. 1.75 to 2.25	16.14
Malleable (local delivery)	13.50
Ohio silvery, 8 per cent.	21.87
Stand. low phos., Valley	25.00

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 55c. average local switching charge; \$3.12 from Jackson, Ohio; \$6.14 from Birmingham.

BIRMINGHAM	
Per gross ton, f.o.b. Birmingham dist. furnaces:	
No. 2 fdy., 1.75 to 2.25 sil.	\$11.00
No. 2 soft, 2.25 to 2.75 sil.	11.50
Basic	11.00

CANADA	
Per gross ton:	
Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75	\$22.60
No. 2 fdy., sil. 1.75 to 2.25	22.10
Malleable	22.60
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75	\$24.00
No. 2 fdy., sil. 1.75 to 2.25	23.50
Malleable	24.00
Basic	\$23.00 to 23.50

Ferromanganese	
Per Gross Ton	
Domestic, 80%, seaboard	\$68.00
Foreign, 80%, Atlantic or Gulf port, duty paid	68.00

Prices for lots of one carload or more; extras applied on less than carload lots.

Spiegeleisen	
Per Gross Ton Furnace	
Domestic, 19 to 21%	\$26.00 to \$27.00

Electric Ferro-silicon	
Per Gross Ton Delivered	
50% (carloads)	\$77.50
50% (less carloads)	85.00
75% (carloads)	126.00
75% (less carloads)	136.00
14% to 16% (f.o.b. Welland, Ont., in carloads)	31.00
14% to 16% (less carloads)	36.00

Bessemer Ferro-silicon	
F.o.b. Jackson County, Ohio, Furnace	
Per Gross Ton	Per Gross Ton
10%	\$20.50
11%	21.00
12%	21.50
13%	22.00
14%	22.50
15%	23.00
16%	23.50
17%	24.00

Silvery Iron	
F.o.b. Jackson County, Ohio, Furnace	
Per Gross Ton	Per Gross Ton
6%	\$18.00
7%	18.50
8%	19.00
9%	19.50
10%	20.00
11%	20.50
12%	21.00
13%	21.50
14%	22.00
15%	22.50
16%	23.00
17%	23.50

Other Ferroalloys

Ferrotungsten, per lb. wo. del., carloads \$1.08

PITTSBURGH	
Per gross ton delivered consumers' yards:	
No. 1 heavy melting steel	\$8.25 to 9.25
No. 2 heavy melting steel	6.75 to 7.25
No. 2 railroad wrought	8.75 to 9.25
Scrap rails	8.75 to 9.25
Rails 3 ft. and under	10.50 to 11.00
Sheet bar crops, ordinary	8.75 to 9.25
Compressed sheet steel	8.00 to 9.00
Hand bundled sheet steel	7.00 to 7.50
Heavy breakable cast	7.00 to 7.50
Machine shop turnings	5.00 to 5.50
Short shov. steel turnings	5.00 to 5.50
Short mixed borings and turnings	5.00 to 5.50
Cast iron borings	5.00 to 5.50
Cast iron car wheels	8.50 to 9.00
Heavy breakable cast	8.00 to 8.50
No. 1 cast	8.50 to 9.50
Railr. knuckles and couplers	9.00 to 9.50
Rail. coll and leaf springs	9.00 to 9.50
Rolled steel wheels	9.00 to 9.50
Low phos. billet crops	11.00 to 11.50
Low phos. sheet bar crops	10.50 to 11.00
Low phos. plate scrap	9.50 to 10.00
Low phos. punchings	9.50 to 10.00
Steel car axles	11.50 to 12.00

CHICAGO	
Delivered Chicago district consumers:	
Per Gross Ton	
Heavy melting steel	\$5.25 to \$5.75
Shoveling steel	5.25 to 5.75

Ferrotungsten, less carloads	\$1.15 to 1.25
Ferrocromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	10.00c.
Ferrocromium, 2% carbon	17.00c. to 17.50c.
Ferrocromium, 1% carbon	19.00c. to 20.00c.
Ferrocromium, 0.06% carbon	23.50c. to 25.00c.
Ferrocromium, 0.06% carbon	25.50c. to 27.00c.
Ferrovandium, del., per lb. contained Va.	\$3.05 to \$3.20
Ferrocobalt, 15% to 18%, per net ton, f.o.b. furnace, in carloads	160.00
Ferrophosphorus, electric, or blast furnace material, in carloads, 18%, Rockdale, Tenn., base	68.00
Per gross ton	
Perrimolybdenum, per lb. Mo., del. 95c.	
Calcium molybdate, per lb. Mo., del.	80c.
Ferrophosphorus, electric, 24% f.o.b. Anniston, Ala., per gross ton	\$21.00
Silico spiegel, per ton, f.o.b. furnace, car lots	42.50
Ton lots or less, per ton	47.50
Silico-manganese, gross ton, delivered:	
2.50% carbon grade	105.00
1% carbon grade	115.00
Spot prices	\$5 a ton higher

Ores	
Lake Superior Ores, Delivered Lower Lake Ports	

Per Gross Ton	
Old range Bessemer, 51.50% iron	\$4.80
Old range non-Bessemer, 51.50% iron	4.45
Mesabi Bessemer, 51.50% iron	4.45
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus 51.50% iron	4.46
Foreign Ore, c.i.f. Philadelphia or Baltimore	

Per Unit	
Iron, low phos., copper free, 55 to 58% iron, dry Spanish or Algerian	\$6. to 8.50c.
Iron, low phos., Swedish, average 68 1/2% iron	9.00c.
Iron, basic or foundry, Swedish, average 65% iron	8.00c.
Iron, basic and foundry, Russian, aver. 63% iron (nom.)	9.00c.
Manganese, Canadian, washed 52% Mn.	24.00c.
Manganese, African, Indian, 50% Mn.	23c. to 24c.
Manganese, Brazilian, 46 to 48% Mn.	21c. to 22c.
Per Gross Ton	
Tungsten, Chinese wolframite	\$10.75 to \$11.00
Tungsten, domestic scheelite	\$10.00 to 10.50
Chrome, 45%, Cr2O3, crude, c.i.f. Atlantic seaboard	18.00
Chrome, 48%, Cr2O3, c.i.f. Atlantic seaboard	20.00

Fluorspar	
Per Net Ton	
Domestic, washed gravel, 85% CaF2, Kentucky and Illinois mines, freight allowed, Pittsburgh basis	\$20.31
No. 2 lump, 85-95, Kentucky and Illinois mines, freight allowed, Pittsburgh basis	22.31
Foreign, 85% calcium fluoride, not over 3% silt, c.i.f. Atlantic port, duty paid, \$17.00 to 17.40	
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2 1/2% silt, f.o.b. Illinois and Kentucky mines	31.06

Iron and Steel Scrap

PITTSBURGH	
Per gross ton delivered consumers' yards:	
No. 1 heavy melting steel	\$8.25 to 9.25
No. 2 heavy melting steel	6.75 to 7.25
No. 2 railroad wrought	8.75 to 9.25
Scrap rails	8.75 to 9.25
Rails 3 ft. and under	10.50 to 11.00
Sheet bar crops, ordinary	8.75 to 9.25
Compressed sheet steel	8.00 to 9.00
Hand bundled sheet steel	7.00 to 7.50
Heavy breakable cast	7.00 to 7.50
Machine shop turnings	5.00 to 5.50
Short shov. steel turnings	5.00 to 5.50
Short mixed borings and turnings	5.00 to 5.50
Cast iron borings	5.00 to 5.50
Cast iron car wheels	8.50 to 9.00
Heavy breakable cast	8.00 to 8.50
No. 1 cast	8.50 to 9.50
Railr. knuckles and couplers	9.00 to 9.50
Rail. coll and leaf springs	9.00 to 9.50
Rolled steel wheels	9.00 to 9.50
Low phos. billet crops	11.00 to 11.50
Low phos. sheet bar crops	10.50 to 11.00
Low phos. plate scrap	9.50 to 10.00
Low phos. punchings	9.50 to 10.00
Steel car axles	11.50 to 12.00

No. 2 busheling.....	\$2.00 to \$2.50
Locomotive tires, smooth...	7.50 to 8.50
Pipes and flues.....	2.50 to 3.00
No. 1 machinery cast.....	6.00 to 6.50
Clean automobile cast.....	6.25 to 6.75
No. 1 railroad cast.....	5.25 to 5.75
No. 1 agricultural cast.....	5.00 to 5.50
Stove plate.....	5.25 to 5.75
Grate bars.....	5.00 to 5.50
Brake shoes.....	5.50 to 6.00

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

PHILADELPHIA

Per gross ton delivered consumers' yards:	
No. 1 heavy melting steel.....	\$6.00 to \$6.50
No. 2 heavy melting steel.....	4.50 to 5.00
No. 1 railroad wrought.....	7.00 to 7.50
Bundled sheets.....	4.00 to 4.50
Hydraulic compressed, new.....	4.50 to 5.00
Hydraulic compressed, old.....	4.00 to 4.50
Machine shop turnings.....	3.00 to 3.50
Heavy axle turnings.....	5.50 to 6.00
Cast borings (nom.).....	3.00 to 3.50
Heavy breakable cast.....	7.50 to 8.00
Stove plate (steel works).....	4.00 to 4.50
No. 1 low phosph. heavy.....	9.50 to 10.00
Stumps and couplers.....	7.00 to 7.50
Rolled steel wheels.....	7.00 to 7.50
No. 1 blast furnace (nom.).....	3.00 to 3.50
Spec. iron and steel pipe.....	5.50 to 6.00
Shafting.....	10.00 to 11.00
Steel axles.....	13.50 to 14.00
No. 1 forge fire.....	5.50 to 6.00
Cast iron car wheels.....	8.00 to 8.50
No. 1 cast.....	8.00 to 8.50
Cast borings (chem.).....	8.00 to 10.50
Steel rails for rolling.....	9.00 to 9.50

CLEVELAND

Per gross ton delivered consumers' yards:	
No. 1 heavy melting steel.....	\$6.25 to \$6.75
No. 2 heavy melting steel.....	5.50 to 6.00
Compressed steel.....	6.00 to 6.25
Light bundled sheet stampings.....	5.25 to 5.50
Drop forge flashings.....	5.00
Machine-shop turnings.....	3.25 to 3.50
Short shoveling turnings.....	4.50 to 5.00
No. 1 busheling.....	5.00 to 5.50
Steel axle turnings.....	5.00 to 5.50
Low phosph. billet crops.....	9.00 to 10.00
Cast iron borings.....	3.50 to 4.00
Mixed borings and short turnings.....	3.50 to 4.00
No. 2 busheling.....	3.50 to 4.00
No. 1 cast.....	6.50 to 7.00
Railroad grate bars.....	5.50 to 6.00
Stove plate.....	6.00 to 6.50
Rails under 3 ft.....	9.00 to 9.50
Rails for rolling.....	9.00 to 9.50
Railroad malleable.....	7.25 to 7.50
Cast iron car wheels.....	7.50 to 8.00

BUFFALO

Per gross ton, f.o.b. Buffalo consumers' plants:	
No. 1 heavy melting steel.....	\$6.50 to \$7.00
Scrap rails.....	6.75 to 7.25
New hydraulic comp. sheets.....	5.00
Old hydraulic comp. sheets.....	4.00
Drop forge flashings.....	5.00
No. 1 busheling.....	5.00
Hyv. steel axle turnings.....	4.00 to 4.50
Machine shop turnings.....	3.50 to 4.00
Knuckles and couplers.....	10.00
Coll and leaf springs.....	10.00
Rolled steel wheels.....	10.00
Low phosph. billet crops.....	10.00 to 10.50
Short shov. steel turnings.....	6.00 to 6.50
Short mixed borings and turnings.....	5.00
Cast iron borings.....	5.00
No. 2 busheling.....	3.50 to 4.00
Steel car axles.....	10.00 to 11.00
Iron axles.....	10.00 to 11.00
No. 1 machinery cast.....	9.00 to 9.50
No. 1 cupola cast.....	8.25 to 8.75
Stove plate.....	7.25 to 7.50
Steel rails, 3 ft. and under.....	9.50 to 10.00
Cast iron car wheels.....	8.00 to 9.00
Industrial malleable.....	8.00 to 8.50
Railroad malleable.....	8.00 to 8.50
Chemical borings.....	7.50 to 8.00

BIRMINGHAM

Per gross ton delivered consumers' yards:	
Heavy melting steel.....	\$7.00 to \$7.50
Scrap steel rails.....	7.50 to 8.00
Short shoveling turnings.....	4.00
Stove plate.....	6.00
Steel axles.....	9.00
Iron axles.....	9.00
No. 1 railroad wrought.....	4.50 to 5.00
Rails for rolling.....	8.00 to 8.50
No. 1 cast.....	8.00
Tramcar wheels.....	8.00
Cast iron borings, chem.....	8.50

ST. LOUIS

Per gross ton delivered consumers' yards:	
Selected heavy steel.....	\$5.50 to \$6.00
No. 1 heavy melting.....	5.00 to 5.50
No. 2 heavy melting.....	4.50 to 5.00
No. 1 locomotive tires.....	4.75 to 5.25
Misc. stand-sec. rails.....	6.00 to 6.50
Railroad springs.....	6.50 to 7.00
Bundled sheets.....	3.50 to 4.00
No. 2 railroad wrought.....	4.50 to 5.00
No. 1 busheling.....	4.00 to 4.25
Cast iron borings and shoveling turnings.....	3.75 to 4.25
Iron rails.....	7.00 to 7.50
Rails for rolling.....	7.00 to 7.50
Machine shop turnings.....	2.50 to 3.00
Heavy turnings.....	4.25 to 4.75
Steel car axles.....	9.00 to 9.50
Iron car axles.....	12.50 to 13.00
Wrot. iron bars and trans.....	5.00 to 5.50
No. 1 railroad wrought.....	3.50 to 4.00
Steel rails less than 3 ft.....	8.50 to 9.00
Steel angle bars.....	6.00 to 6.50

Cast iron car wheels.....	5.00 to 5.50
No. 1 machinery cast.....	6.50 to 7.00
Railroad malleable.....	4.75 to 5.25
No. 1 railroad cast.....	5.75 to 6.25
Stove plate.....	5.50 to 6.00
Relay, rails, 60 lb. and under.....	16.00 to 16.50
Relay, rails, 70 lb. and over.....	20.00 to 21.00
Agricult. malleable.....	5.00 to 5.50

NEW YORK

Dealers' buying prices per gross ton:	
No. 1 heavy melting steel.....	\$4.00 to \$4.50
No. 2 heavy melting steel.....	2.00 to 2.25
Heavy melting steel (yard).....	2.50 to 3.00
Machine shop turnings.....	4.50 to 4.75
Stove plate (steel works).....	2.25 to 2.75
Machine shop turnings.....	0.50 to 1.00
Short shoveling turnings.....	0.50 to 1.00
Cast borings.....	0.50 to 1.00
No. 1 blast furnace.....	0.50 to 1.00
Steel car axles (nom.).....	5.00 to 5.50
Iron car axles.....	14.00 to 14.50
Spec. iron and steel pipe.....	2.00 to 2.50
Forge fire.....	3.25
No. 1 railroad wrought.....	4.00 to 4.50
No. 1 yard wrought, long.....	3.25 to 3.50
Rails for rolling.....	3.00 to 3.50
No. 2 cast.....	4.00 to 4.25
Stove plate (foundry).....	3.25
Malleable cast (railroad).....	3.50 to 4.00
Cast borings (chemical).....	6.00 to 6.50

Per gross ton, delivered local foundries:

No. 1 machinery cast.....	\$8.00
No. 1 hvy. cast (cupola size).....	7.50
No. 2 cast.....	6.50

PITTSBURGH

Base per Lb.	
Plates.....	2.85c
Structural shapes.....	2.85c
Soft steel bars and small shapes.....	2.60c
Reinforcing steel bars.....	2.60c
Cold-finished and screw stock—	
Rounds and hexagons.....	2.95c
Squares and flats.....	2.95c
Bands.....	2.95c
Hoops.....	3.00c
Hot-rolled annealed sheets (No. 24), 25 or more bundles.....	3.15c
Galv. sheets (No. 24), 25 or more bundles.....	3.50c
Hot-rolled sheets (No. 10).....	3.10c
Galv. corrug. sheets (No. 28), per square (less than 3750 lb.).....	\$3.74
Spikes, large.....	2.50c
Small.....	2.75c to 2.90c
Roat.....	3.00c
Track bolts, all sizes, per 100 cent. off list.....	
Machine bolts, 100 count.....	70 per cent. off list
Carriage bolts, 100 count.....	70 per cent. off list
Nuts, all styles, 100 count.....	70 per cent. off list
Large rivets, base per 100 lb.....	\$3.00
Wire, black, soft ann'd, base per 100 lb.....	2.75
Wire, galv. soft, base per 100 lb.....	3.20
Common wire nails, per keg.....	2.35
Cement coated nails, per keg.....	2.35

On plates, structural, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applied to orders of 400 to 999 lb.

CHICAGO

Base per Lb.	
Plates and structural shapes.....	3.00c
Soft steel bars.....	2.75c
Reinforcing bars, billet steel.....	1.65c to 1.75c
Rail steel reinforcement.....	1.45c
Cold-fn. steel bars and shafting—	
Rounds and hexagons.....	2.95c
Plates and squares.....	3.45c
Bands, 3/4 in. (in Nos. 10 and 12 gages).....	2.95c
Hoops (No. 14 gage and lighter).....	3.50c
Hot-rolled annealed sheets (No. 24).....	3.55c
Galv. sheets (No. 24).....	4.10c
Hot-rolled sheets (No. 10).....	3.20c
Spikes (3/4 in. and lighter).....	3.45c
Track bolts.....	4.30c
Rivets, structural.....	3.75c
Rivets, boiler.....	3.75c

Per Cent Off List

Machine bolts.....	70
Carriage bolts.....	70
Coach and lag screws.....	70
Hot-pressed nuts, sq. tap, or blank.....	70
Hot-pressed nuts, hex. tap, or blank.....	70
No. 8 black ann'd wire, per 100 lb.....	\$3.45
Com. wire nails, base per keg.....	2.30
Cement c'd nails, base per keg.....	2.30

NEW YORK

Base per Lb.	
Plates and struc. shapes.....	2.70c to 3.10c
Soft steel bars, small shapes.....	2.70c to 3.10c
Iron bars, Swed. charcoal.....	6.00c to 6.50c
Cold-fn. shafting and screw stock—	
Rounds and hexagons.....	3.52c
Plates and squares.....	4.02c
Cold-rol. strip, soft and quarter hard.....	4.95c
Hoops.....	3.75c
Bands.....	3.40c
Hot-rolled sheets (No. 10).....	3.00c to 3.25c
Hot-rolled ann'd sheets (No. 24).....	3.50c
Galvanized sheets (No. 24).....	4.00c
Long term sheets.....	12.00c
Standard tool steel.....	3.60c
Wire, black annealed (No. 10).....	4.05c
Wire, galv. annealed (No. 10).....	4.05c
Tire steel, 1/2 x 1/2 in. and larger.....	3.40c
Smooth finish, 1 to 2 1/2 x 1/4 in. and larger.....	3.75c
Open-hearth spring steel, bases.....	4.50c to 7.00c
Common wire nails, base, per keg.....	\$2.60

BOSTON

Dealers' buying prices per gross ton:

No. 1 heavy melting steel.....	\$3.35
Scrap T rails.....	3.35
Machine shop turnings.....	0.80 to 1.00
Cast iron borings.....	1.05
Bundled skeleton, long.....	2.00 to 2.10
Forge flashings.....	3.00 to 3.50
Blast furnace scrap.....	0.90 to 1.00
Forge scrap.....	3.00 to 3.25
Shafting.....	9.50 to 10.00
Steel car axles.....	9.00 to 9.50
Wrought pipe.....	4.00 to 4.25
Rails for rolling.....	4.50 to 5.00
Cast iron borings, chemical.....	7.00 to 7.25
Textile cast.....	\$7.00 to \$7.50
No. 1 machinery cast.....	7.50 to 8.00
Stove plate.....	5.00 to 5.25
Railroad malleable.....	10.50 to 11.00

Per gross ton delivered consumers' yards:

Heavy melting steel.....	\$4.50 to \$5.00
Scrap rails for melting.....	6.00 to 6.50
Loose sheet clippings.....	1.00 to 1.50
Bundled sheets.....	4.25 to 4.75
Cast iron borings.....	2.75 to 3.25
Machine shop turnings.....	2.75 to 3.25
No. 1 busheling.....	2.00 to 2.50
No. 2 busheling.....	2.00 to 2.50
Rails for rolling.....	6.50 to 7.00
No. 1 locomotive tires.....	7.00 to 7.50
Short rails.....	8.00 to 8.50
Cast iron car wheels.....	8.50 to 9.00
No. 1 machinery cast.....	8.50 to 9.00
No. 1 railroad cast.....	7.50 to 8.00

CINCINNATI

Dealers' buying prices per gross ton:

Heavy melting steel.....	\$4.50 to \$5.00
Scrap rails for melting.....	6.00 to 6.50
Loose sheet clippings.....	1.00 to 1.50
Bundled sheets.....	4.25 to 4.75
Cast iron borings.....	2.75 to 3.25
Machine shop turnings.....	2.75 to 3.25
No. 1 busheling.....	2.00 to 2.50
No. 2 busheling.....	2.00 to 2.50
Rails for rolling.....	6.50 to 7.00
No. 1 locomotive tires.....	7.00 to 7.50
Short rails.....	8.00 to 8.50
Cast iron car wheels.....	8.50 to 9.00
No. 1 machinery cast.....	8.50 to 9.00
No. 1 railroad cast.....	7.50 to 8.00

Warehouse Prices for Steel Products

Per Cent Off List	
Machine bolts, cut thread:	
3/4 x 6 in. and smaller.....	65 to 65 and 10
1 x 30 in. and smaller.....	65 to 65 and 10
Carriage bolts, cut thread:	
3/4 x 6 in. and smaller.....	65 to 65 and 10
3/4 x 20 in. and smaller.....	65 to 65 and 10
Roller tubes:	
Lap welded, 2-in.....	\$18.05
Seamless welded, 3-in.....	19.24
Charcoal iron, 2-in.....	24.94
Charcoal iron, 4-in.....	63.65

*No. 28 and lighter, 36 in. wide, 20c higher per 100 lb.

ST. LOUIS

Base per Lb.	
Plates and struc. shapes.....	3.25c
Bars, soft steel or iron.....	3.00c
Cold-fn. rounds, shafting, screw stock.....	3.31c
Hot-rolled annealed sheets (No. 24).....	3.35c
Galv. sheets (No. 24).....	3.35c
Hot-rolled sheets (No. 10).....	3.35c
Black corrug. sheets (No. 24).....	3.85c
Galv. corrug. sheets.....	4.40c
Structural rivets.....	4.00c
Boiler rivets.....	4.00c
Tank rivets, 7/8 in. and smaller, 100 lb. or more.....	65
Less than 100 lb.....	60
Machine bolts.....	70
Carriage bolts.....	70
Lag screws.....	70
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more.....	70
Less than 200 lb.....	60
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more.....	70
Less than 200 lb.....	60

PHILADELPHIA

Base per Lb.	
Plates, 1/4-in. and heavier.....	2.45c
Structural shapes.....	2.45c
Soft steel bars, small shapes, iron bars (except bands).....	2.45c
Reinforce. steel bars, sq., twisted and deformed.....	2.30c
Cold-fn. steel, rounds and hex.....	3.50c
Cold-fn. steel, sq. and flats.....	4.00c
Steel hoops.....	3.00c
Steel bands, No. 12 to 3/16-in., incl.....	2.75c
Spring steel.....	5.00c
Hot-rolled annealed sheets (No. 24).....	3.55c
Galvanized sheets (No. 24).....	3.75c
Hot-rolled and annealed sheets (No. 10).....	3.05c
Diam. pat. floor plates, 1/4 in.....	5.00c
Swedish iron bars.....	5.60c

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

CLEVELAND

Base per Lb.	
Plates and struc. shapes.....	2.95c
Soft steel bars.....	2.75c
Reinforce. steel bars.....	1.75c to 1.95c
Cold-fn. rounds and hex.....	2.95c
Cold-fn. flats and sq.....	3.45c
Hoops and bands, No. 12 to 3/16 in., inclusive.....	3.00c
Hoops and bands, No. 13 and lighter.....	2.55c
Cold-finished strip.....	5.55c
Hot-rolled annealed sheets (No. 24).....	3.25c
Galvanized sheets (No. 24).....	3.75c
Hot-rolled sheets (No. 10).....	3.00c
Black ann'd wire, per 100 lb.....	\$2.75
No. 9 galv. wire, per 100 lb.....	3.20
Com. wire nails, base per keg.....	2.25

*Net base, including boxing and cutting to length.

CINCINNATI

Base per Lb.	
Plates and struc. shapes.....	3.25c
Bars, soft steel or iron.....	3.00c
New billet reinforce. bars.....	3.00c
Rails steel reinforce. bars.....	3.00c
Hoops.....	3.20c
Bands.....	3.20c

Burnt cast.....	3.25 to 3.75
Stove plate.....	3.25 to 3.75
Agricultural malleable.....	7.00 to 7.50
Railroad malleable.....	7.50 to 8.00

DETROIT

Dealers' buying prices per gross ton:	
Hyv. melting steel.....	\$4.50 to 5.00
Borings and short turnings.....	1.75 to 2.25
Long turnings.....	1.50 to 2.00
No. 1 machinery cast.....	7.50 to 8.00

Fabricated Structural Steel

Awards Decline—New Projects Also Smaller

WITH lettings of only 7600 tons, mostly in small tonnages, more than one-half of this total is required for bridges in various sections of the country. The largest booking, 2600 tons, is for a bridge over the Shrewsbury River in Monmouth County, New Jersey. New projects of 12,800 tons compare with 16,500 tons in the previous week and 15,300 tons two weeks ago. The outstanding job is 8000 tons for a custom house in Philadelphia, bids for which probably will be called in August. Awards follow:

NORTH ATLANTIC STATES

State of Maine, 160 tons, Ellsworth-Oakland highway bridge, to American Bridge Co.
Boston, 108 tons, restaurant chain warehouse, to New England Structural Co.
Albany, N. Y., 175 tons, chapel for Methodist Episcopal Church, to Lackawanna Steel Construction Corp.
Brooklyn, 210 tons, warehouse, Trunz Pork Stores, Inc., to Berkshire Iron Works.
Teaneck, N. J., 225 tons, St. Anastasia School, to Harris Structural Steel Co.
Big Flats, N. Y., 400 tons, highway bridge, to McClintic-Marshall Corp.
Monmouth County, N. J., 2600 tons, Shrewsbury River bridge, to American Bridge Co.
Ocean City, N. J., 640 tons, Somers Point bridge, to American Bridge Co.
Philadelphia, 8000 tons, custom house; bids probably will be asked in August.
Stroudsburg, Pa., 165 tons, church and school, to Lehigh Structural Steel Co.
Montgomery County, Pa., 160 tons, to McClintic-Marshall Corp.

SOUTH AND SOUTHWEST

Lynchburg, Va., 400 tons, post office, to Virginia Bridge & Iron Co.
Atlanta, 180 tons, Loew's theater, to Ingalls Iron Works.
Illinois Central Railroad, 500 tons, truss bridges in Kentucky, to American Bridge Co.
McCulloch County, Tex., 210 tons, bridge, to Mosher Steel & Machinery Co.
Falls County, Tex., 360 tons, bridge, to Mosher Steel & Machinery Co.
Beckham County, Okla., 500 tons, highway bridge, to Bordman Co.

CENTRAL STATES

Clinton County, Mo., 145 tons, highway bridge, to Clinton Bridge Works.
Sturtevant, Wis., 150 tons for Milwaukee Road, to American Bridge Co.
Monroe County, Wis., 100 tons, highway bridge, to Worden-Allen Co.
Coffeyville, Kan., 100 tons, boiler house for Sinclair Refining Co., to Lackawanna Steel Construction Corp.

WESTERN STATES

San Luis Obispo, Cal., 180 tons, State highway bridge, to Judson-Pacific Co.
Oakland, Cal., 150 tons, store for W. T. Grant Co., to Judson-Pacific Co.

NEW STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

Braintree, Mass., 100 tons, power house addition.
State of New York, 600 tons, highway bridges.
State of New Jersey, 450 tons, viaduct over South River, Old Bridge.
Elmira, N. Y., 300 tons, addition to State Reformatory.
Washington, 350 tons, National Institute of Health administration building.
Philadelphia, 400 tons, addition to Federal Reserve Bank, bids to be taken July 11.

Saratoga Springs, N. Y., 840 tons, drink hall; Saxon Co., New York, general contractor.

CENTRAL STATES

Henderson County, Ill., 450 tons, highway bridge, Vincennes Bridge Co. low bidder.
Algonquin, Ill., 450 tons, highway bridge; McClintic-Marshall Corp., low bidder.

WESTERN STATES

Las Vegas, Nev., 100 tons, post office; bids close June 28.
Marin Meadows, Cal., 900 tons, buildings at Hamilton Field bombing base; bids called June 20.
Glendale, Cal., 450 tons, post office; bids close July 7.
Seattle, Wash., 700 tons, highway bridge for King County.

FABRICATED PLATE

NEW PROJECTS

Oakland, Cal., 250 tons, 24-in. plate, $\frac{1}{4}$ in. thick, for East Bay Municipal Utility District; bids close June 24.

Today's High Cost of Making Steel

(Concluded from page 1359)

1932 total cost would still be 1.95 times the 1915 cost.

Overhead does not enter into these cost comparisons, at least not in any important way, and yet that item today is the chief factor in keeping operations on the losing side. Just how overshadowing it is may be indicated in the case of this company. When operating at an 85 per cent of capacity basis, a 10 per cent increased activity would bring unit costs down in the order of 75c. a ton. The same increase in volume of business when the company is working at a 20 per cent gait would bring about a reduction of cost of more than \$9 a ton. Obviously if sufficient tonnage could be booked to raise operations the 10 points over a considerable period of time, a large fraction of the \$9 a ton lower cost could be passed on to the buyer and the company be better off. If it gave away all of the \$9, its prices would still be above those of 1915, as today's quotations average \$10 a ton above those of 1915. And manifestly the steel industry in its present condition cannot pass on economies dependent on volume before the volume appears.

In the matter of price spreads, it may be emphasized that one form of steel, representing some 4 per cent

of all the rolled iron and steel manufactured, is below the 1915 levels by a wide margin, namely, galvanized sheets, quotations of which average roughly \$7 lower than in 1915. Other flat-rolled products, notably auto-body sheets and strips, have likewise met with sweeping cuts, current prices being in fact more than \$80 a ton under their highs of the last decade or so. Hardly a more striking example throughout all industry could be found than this one of the rapid passing on to the consumer of the cost reductions following the introduction of a new process and the intensive mechanization of existing ones. Things may not be volatile in steel, but they are not static, and there should not be so much concern in uninformed circles over a belief that the law of supply and demand is not freely working.

There Are Limits to Wage Cuts

In the last analysis, in all this academic agitation for price reductions, the demand is for further drastic deflation of labor. At the present time, the labor item represents the cost of the irreducible minimum of the working force, including the necessity of retaining key men against the return of activity. When operations increase, it is undoubtedly true that the labor item will be smaller relatively. But if it were possible to eliminate the labor item altogether, costs would be considerably above those of 1915.

The sociological student, though he never managed labor, always knows how to deal with it; similarly, the gatherer of statistics is ever ready to inform the industrialist when and how much to change prices.

Cast Iron Pipe

Waltham, Mass., has awarded 150 tons to R. D. Wood & Co.

A New Jersey public utility purchased 700 tons of large sizes from an unnamed pipe maker.

Baltimore is taking bids on upward of 1000 tons of 6-in. and larger sizes.

Washington is in the market for 1000 tons of 36- and 48-in.

Milwaukee closes bids June 24 on about 4000 tons of 24- and 36-in. class C.

Pipe Lines

Lycoming Natural Gas Co., Wellsboro, Pa., an interest of Standard Oil Co. of New Jersey, 26 Broadway, New York, plans installation of 20-in. welded steel pipe line from Tioga County natural gas field to Potter County gas field, northern part of Pennsylvania, about 40 miles. Cost over \$350,000.

Santa Maria Gas Co., Santa Maria, Cal., has begun work on natural gas steel pipe line from point near Santa Maria River to Oilport, vicinity of Avila, Cal., about 21 miles. Cost about \$200,000.

Iowa-Nebraska Light & Power Co., Lincoln, Neb., plans early construction of a natural gas pipe line from its main trunk system to Shenandoah, Iowa, and vicinity. Company has also secured franchise for similar pipe line to Red Oak, Iowa, and vicinity, where natural gas will be furnished.

Ray D. Galston, Tyler, Tex., is at head of project to build a natural gas pipe line from Brownwood, Tex., to Lampasas, Tex., and vicinity.

Properties Which Characterize Chromium Plating

(Concluded from page 1345)

porosity becomes visible when the sheet of metallic chromium is placed in front of a bright light.

Brittleness

In metallurgy it may be stated as a general axiom that increased hardness carries with it an increase in brittleness. The results of early work in chromium plating appeared to indicate the association of brittleness with hardness. However, as the influence of the variables controlling the hardness of chromium has been recognized, it has been found that it is possible to plate an extremely hard but tough deposit of chromium. This is evidenced by the fact that a thin coat of chromium properly applied will not peel, flake, or blister on the bending of the base metal.

In this connection it is interesting to note the parallelism to the toughness of diamond as shown by a test for a diamond which consists in submitting it to a sledge hammer blow when placed on an anvil.

Adhesion to Base

Unquestionably the greatest shop difficulty in the development stage of chromium plating was the peeling of the chromium from the foundation metal. In case an intermediate plate of copper or nickel was used, the chromium tended to lift the first plate from the base.

This tendency toward peeling has been found to be due to the fact that any metal when plated on one side only of a thin strip tends to bend the strip concave toward the anode. This is because lateral tension is set up in the crystalline structure of an electro-deposit. With relatively soft metals, such as copper and nickel, the stresses are not noticed. But in chromium the stresses are of large magnitude, due to the high mechanical qualities of chromium.

In order to obtain proper adhesion to the foundation metal the advent of chromium fostered revolutionary processes in metal cleaning. The art of electro-cleaning, usually cathodic followed by anodic, was developed, so that now peeling is almost unknown in modern practice. In order to eliminate the human equation in cleaning, up-to-date plants are using full automatic equipment both in cleaning and in plating. Another illustration shows automobile bumpers being electro-cleaned and plated.

Chromium has a greater adhesion to a proper foundation metal than any other electroplate. This may be shown by drawing chromium-plated iron wire down to one-tenth of its original diameter without rupturing

the adhesive bond. Incidentally this drawing operation also evidences the ductility of chromium plate.

Coefficient of Reflection

With the advent of commercial flood lighting, a need arose for a reflecting metal which would stand up under flood light conditions. In 1923 Westinghouse decided that chromium possesses the desired qualities. Early the next year the writer developed chromium plated reflectors, the illustration being made from a photograph made in 1924. This work was described in a paper on the "Reflective Properties of Chromium," presented before the annual convention of the Illuminating Engineering Society at Detroit, Sept. 15, 1925.

The paper states that accelerated life tests were made on chromium-plated reflectors at 300 deg. C. without indication of tarnishing. Since then chromium-plated reflectors have been in continuous service for six years without visible signs of deterioration, thereby substantiating the results of the accelerated life tests.

The reflectivity of chromium is selective to about the same extent as silver. It is doubtful if the ordinary observer would be able to distinguish between the two. Therefore, the color is pleasing. The coefficient of reflection of chromium is initially high and remains high throughout an accelerated life test, having a value of about 65 per cent.

Coefficient of Friction

Chromium has certain surface characteristics which give it a lower coefficient of friction than that of any other metal. These include surface tension, lack of stickiness, hardness and smoothness. The surface tension property of chromium is shown by the fact that water forms drops on chromium rather than remaining in a film. The lack of stickiness is shown in chromium-plated molds for materials such as bakelite.

Chromium is the only metal which will stand up against aluminum in bearings which are not lubricated. Incidentally this opens up a new field in oilless bearings. The following instructive values have been published for the coefficient of static and sliding friction:

Metals	Static	Sliding
Chromium on chromium..	0.14	0.12
Babbitt on chromium.....	0.15	0.13
Steel on chromium.....	0.17	0.16
Steel on steel.....	0.30	0.20
Steel on babbitt.....	0.25	0.20
Babbitt on babbitt.....	0.54	0.19

Temperature Resistance

The melting point of chromium is 2339 deg. F., as compared with 2570,

the melting point of high-carbon steel. Chromium will retain its physical structure up to 2250 deg.

At a temperature of less than 1200 deg. F. chromium will not oxidize, but retains its bright surface. In results, as yet unpublished, the writer has found that chromium permanently loses its hardness at the same temperature at which surface oxidation takes place.

Visually it is very easy to distinguish chromium which has been subjected to an oxidizing temperature, by the formation of color on its surface. The degree of oxidation is shown by the particular prismatic color, which is dependent on the thickness of the oxide film, since the color is due to light interference. This is because the thickness of the oxide corresponds to the optical wave length of the particular color of the oxide film.

The oxide film is apparently more refractory to high temperatures than the chromium itself. Therefore in certain welding operations, an oxidized chromium surface has withstood momentarily surface temperatures of over 3000 deg. F., which is higher than the melting point of chromium.

Ohio River Shipments of Steel Lower in May

Movement of iron and steel products on the Ohio River in the Pittsburgh district during May amounted to 28,267 net tons, according to the United States Engineer Office, Pittsburgh. This compares with 32,972 tons in April, and with 59,611 tons in May, 1931. The Monongahela River May shipments of steel products were 23,941 tons, as compared with 23,849 tons in the preceding month, and with 35,373 tons in May of last year. Shipments of iron and steel on the Allegheny River were 2550 tons in May, 501 tons in April, and 1330 tons in May, 1931.

Nickel Uses Gaining

International Nickel Co. reports that its sales of nickel in all forms in 1931 showed an increase of 104 per cent over similar sales in 1921, indicating that nickel consumption is increasing at a comparatively rapid rate. This encouraging trend is especially reflected in nickel steel, where the amount of nickel used per ton of alloy steel produced in the United States increased about 25 per cent as compared with 1930. Among interesting new nickel products developed in the past year was nickel-clad steel plate, which has been introduced in storage tanks and tank cars, evaporator bodies, chemical autoclaves, kettles, etc.

Farm Implement Manufacturer Combats the Depression

(Concluded from page 1347)

factory trucks after they had cut the wood in their spare time. This activity enables the men to maintain better morale by working during the time when the plant is closed down and places them in a better position to maintain themselves financially due to this cheap supply of fuel.

The "Cellar-Full-of-Food" Plan

In looking ahead to next summer, with the special consideration that we are in a rural community, we have worked up in tentative form the "Cellar-Full-of-Food" plan. I do not recall any other instance where our method of financing the project by means of orders to be redeemed in the form of produce has been used. Perhaps we have nothing new in this particular phase of the work but at any rate the whole project as we have worked it out is based on our previous experience in group gardening and we believe that, under our particular circumstances, it is going to be a workable plan with the prospect of very helpful results.

The tentative outline of this plan, as we have it in mind today but still subject to revision, follows:

The object of this group or community garden plan is the production in real volume of a limited list of garden products that are best suited for storage or canning for winter use. In other words, to insure in advance ample food supplies for the long winter months insofar as these supplies can be furnished from the soil.

The program is to be carried out by two general committees—

1. The Garden Committee.
2. The Business Committee.

The list of products to be raised might include the vegetables that lend themselves readily to canning or storage in the natural state for winter use. This list would naturally include tomatoes, several varieties of beans, cabbage, celery, squash, and the root crops such as carrots, beets, parsnips, potatoes, etc.

The above list of vegetables would not take the place of the ordinary kitchen garden near the home and it would be understood that members in this unique garden club would supply day to day requirements during the summer from their regular gardening operations at home.

It would seem desirable for each

member to make a small contribution into a common fund to finance the initial expense of plowing, purchase of seed, etc. Individuals who may not have the ready cash would be allowed to sign a work pledge at a fixed rate of wages per hour and once having worked out the amount of his pledge he would be a member in good standing just the same as the man who paid cash.

Produce Distributed Proportionately to Hours

Labor of planting, cultivating and harvesting the crops will be supplied direct from the membership. A time-keeper and clerk will keep accurate records of the hours worked by each individual and the worker will be paid with an order which he understands would represent an equivalent value in produce at the end of the season. When the crops are all harvested it is proposed to set the value of the crop over against the total of the bills payable in the form of unpaid orders and divide the total crop among the members of the group in proportion to the number of hours worked on the project.

Members who contribute cash but do not work in the garden would participate in the distribution of the crops in proportion to their cash contribution set up in the form of hours of labor at the prevailing rate. For instance, if a man contributes \$2 in cash and the labor rate is fixed at 20c. per hour this individual would have credit for ten hours of work in the final division of the products of the garden.

Any cash balance is to be distributed among the members of the Club in exactly the same proportion as the products of the garden—i.e., on the basis of hours worked at the established rate. In this connection it might be necessary to establish a limit to the number of hours per week which any member will be allowed to work during the season.

Factory Production Improvements

While making every effort to meet our personnel problem as effectively as possible, we are also making simultaneous efforts along technological lines to improve our position as producers of goods. Thus the factory production processes have been scrutinized as never before with the view

of bringing our mechanical equipment up to the highest possible state of perfection, both from the standpoint of quality and quantity of output.

The improvements in production were approached from the standpoint of—

1. Increased output of individual machines by studying feeds and speeds as well as handling the product in the most convenient manner possible.

2. Improvement in quality by reshaping dies and forming tools for improved appearance of the product.

3. Reduction of waste due to spoilage in process.

4. Protection of the operator against accidents by careful study of safety devices.

In increasing output we went directly to the key machines which handle the bulk of the product and in redesigning one special woodworking machine it resulted in 10 per cent increase in output immediately with added advantage of practically complete elimination of spoilage.

Under our State laws we are compelled to report every accident to a workman where it is necessary to have the attention of a doctor. Our records for medical expense and loss time for which we paid under the Compensation law are as follows:

July 1, 1928 — July 1, 1929 —	\$1,018.65
July 1, 1929 — May 1, 1930 —	819.36
May 1, 1930 — May 1, 1931 —	402.55
May 1, 1931 — Feb. 1, 1932 —	117.77

Improvements in Selling

On the selling end we have set up a regional sales program. For instance in New England our men cover the territory in the usual manner with the program that includes delivery from a New England stock of True Temper products including all the lines produced in Wallingford as well as the more desirable specialties in this region produced in other factories. In years past it has been more or less necessary for our customers to get one item from one plant and another from another plant.

We are not making any new products of unique design or appeal but we are trying to round out the line of hand tools using a combination of wood handles and metal heads, with each tool given special attention as to quality, design and finish, then backing up the whole program with national advertising as well as consumer advertising in the form of booklets giving practical advice on gardening, etc. We also supply dealer helps in the way of window displays, envelope stuffers, etc.

Beryllium Alloys Have Commercial Possibilities

(Concluded from page 1346)

ness of 0.1 mm.) from cast alloys containing beryllium up to 75 per cent, the highest percentage that has been investigated. The rolling is either done cold, with occasional annealing at 600 deg C., or hot at 600 to 650 deg. C.

Efforts to alloy beryllium with magnesium have been unsuccessful, because at temperatures below its own melting point, beryllium does not dissolve in liquid magnesium. On the other hand, it is not possible to heat the two metals up to the melting point of beryllium because the magnesium boils before that temperature is reached. The very numerous investigations by Siemens and Halske on the properties of a series of ternary light metal alloys containing beryllium will not be discussed here. Suffice it to say that no results of any practical value have so far been obtained.

Surprising Results with Copper

On the other hand, when heavy metals such as copper are alloyed with a small per cent of beryllium, surprising results as to temper and hardness are obtained. Siemens and Halske have explored this field with great thoroughness, employing all modern methods of the metallurgical art. Many valuable commercial applications have been developed. This is especially true of the beryllium-copper alloys.

Alloys of beryllium with copper and with other heavy metals are best produced electrolytically by adding the finely divided alloying metal to the fused beryllium oxyfluoride bath. The added metal melts, sinks to the bottom of the crucible (which serves as anode), is converted into the fluoride and dissolved in the melt and finally migrates with the beryllium to the cathode where the alloy separates out. This procedure is especially applicable to beryllium-rich alloys. To produce alloys of low beryllium content, one may use a cathode of the metal to be alloyed, for example, a cathode of molten copper, which dissolves the electrolytically deposited beryllium.

Beryllium-Bronzes

The beryllium-bronzes are about as resistant to corrosion as the tin or the aluminum bronzes. They likewise cast easily and are readily cold worked. They can also be hardened by a suitable heat treatment. When 2 to 3 per cent Be is added to copper, the hardness is increased to five times the original (from 100 up to 400 or 500 Brinell); the limit of

ductility is increased seven-fold, the breaking and the bending limits, three-fold. A copper alloy with 6 to 7 per cent Be has a Brinell hardness of 750, corresponding to that of the hardest steel. Masing of S. & H. has studied in much detail the changes accompanying these improvements and hardening processes. The phenomena are quite complicated. As compared with other bronzes, beryllium-bronzes show the highest electrical conductivity, and they are easier to shape. Their greater hardness and strength permit them to be used for structural members that are subject to severe strain. In many cases a decided saving in weight and cross-section is brought about.

A bright commercial future is to be predicted for these Be bronzes. They are already used for springs possessing a peculiar mechanical and chemical resistance, and showing very slight fatigue phenomena. Leaf springs have endured 10,000,000 bends without breaking. One such spring was even stressed 16,000,000 times and remained undamaged. In the case of electric locomotives, the uninterrupted jarring causes brush-holders and contact-caps to last but a few weeks, when made of a beryllium-free bronze. The resulting necessary renewals are very disturbing and add to the uncertainty in railway operation. The use of beryllium-bronzes eliminates this uncertainty.

These Be-bronzes will also find application in the construction of aircraft and ships, as, for example, in the suspension-springs of airplane landing gear where special strength is needed to withstand the heavy shocks that often occur during landing. The bronzes are specially suited for those parts of electromotors and internal combustion engines that have to withstand heavy impact. The high resistance of the bronzes to corrosion and to erosion renders them suitable for pumps, liquid meters, turbine blades and the like. In many cases beryllium bronzes will undoubtedly be employed because of the greater reliability, even though the initial cost is higher.

Alloys of beryllium with nickel or cobalt, as well as the three-metals systems, beryllium - copper - nickel, beryllium-copper-zinc, and beryllium-copper-aluminum, possess similar useful properties.

Be-Fe Alloys Promise Commercial Value

Kroll has in recent years studied beryllium-iron alloys. His researches

are still in progress, but they already promise results of probable commercial value. Thus, alloys of iron, chromium, nickel, and beryllium show not only a chemical resistivity corresponding to that of V2A-steel (18 per cent Cr, 8 per cent Ni), but excellent hardness, strength and elasticity. It has been found possible to produce beryllium-steels, without adding carbon, that have an appreciable residual magnetism. When the binary beryllium-steels are annealed, they resemble silicon-steel. According to Kroll, iron-alloys composed of 12 per cent Cr, 5 per cent Ni, and 1 per cent Be attain the temper of high-speed steel after aging. An alloy of 20 per cent Cr, 7 per cent Ni and 1 per cent Be behaves like a temperable V2A-steel, while an alloy of 36 per cent Ni with 1 per cent Be resembles invar-steels, combining good resistance to the atmosphere with considerable strength after tempering.

Incidentally pure science also profits from the greater availability of metallic beryllium. The element has done us good service, recently, in our studies of the boron hydrides. Heretofore these have been obtained by decomposing magnesium boride with acids, but they always contained some silicon hydride, the removal of which is troublesome, tedious and wasteful of material. If magnesium boride is replaced by beryllium boride (prepared from beryllium and boron trioxide) there is then no difficulty in obtaining a boron hydride free from silicon hydride, an improved product of great value in the study of the chemistry of boron.

Present Output and Price

In closing, a few statements regarding the present production and price of beryllium may be opportune. The installation now operated by Siemens and Halske can produce a few tons of beryllium annually. According to its degree of purity, beryllium costs from 18 to 65c. per gram (\$8 to \$30 per lb.). The price of the beryllium alloys corresponds generally to their beryllium content. As the consumption of beryllium becomes more extensive and its production increases, we may expect a considerable reduction in its price. Certain alloys such as the beryllium-bronzes may be produced relatively cheaply by direct methods, without the necessity of first preparing pure beryllium as pointed out above.

Both the Oxweld No. 14 drawn aluminum rod for welding sheet aluminum and the No. 23 aluminum rod for welding cast and sheet aluminum and aluminum alloys are now available in 10-lb. coils of 1/4-in. diameter rod, announces the Linde Air Products Co., 30 East Forty-second Street, New York. Advantages of the coil form include reduction in amount of waste from short ends in production work.

PLANT EXPANSION AND EQUIPMENT BUYING

Machine Tool Orders Off in May

Current Buying Light—Orders for Special-Purpose Tools in Prospect at Detroit

THE National Machine Tool Builders' Association reports that orders in May are represented by the index figure 38.9 against 41.1 in April, and 32.6 in March. With the exception of February and March of this year, the May sales were the smallest for any month of 1931 and 1932.

The three months' moving average of the association rose to 37.5 against 37.1 in April, but the April figure was a drop from that of March. Unfilled orders rose slightly in May to 64.6 against 62.9 in April, but this increase was brought about by a decline in

shipments, which are represented by the figure of 31.6 for May against 50.8 for April. The association derives its base figure of 100 from the average of monthly shipments of 1922, 1923 and 1924.

Prospects for purchases of standard machine tools at Detroit are not promising, but various automobile companies, and particularly Ford, are likely to place liberal orders for special-purpose equipment.

Current buying of machinery is light, although both Pittsburgh and Cincinnati report a slight upturn in

bookings during the past week. At Cincinnati an automobile manufacturer placed an order for rebuilding seven crankshaft lathes and inquiries from the Federal Government for a variety of tools are being figured on. At Pittsburgh the board of education has taken bids on 12 lathes for the new Westinghouse High School, while the Carnegie Steel Co. has bought a 36-in. cold saw for its Duquesne, Pa., works. Chicago trade is quiet, although jobbing machine shops are somewhat busier, with some of them on the point of adding more men to their present force.

◀ NORTH ATLANTIC ▶

Board of Transportation. 250 Hudson Street, New York, is securing fund of \$106,000 from Board of Estimate and Apportionment, Municipal Building, for purchase of miscellaneous equipment for city-owned subway system; also an appropriation of \$1,454,000 for subway construction.

Signal Supply Officer, Army Base, Brooklyn, asks bids until June 28 for 2000 mast sections, 200 mast bases, quantity of connectors, clips, covers, etc., (Circular 170).

Colonial Beacon Oil Co., 155 East Forty-fourth street, New York, has let general contract to J. B. Roberts & Co., 949 Broadway, for bulk oil storage and distributing plant at Brooklyn. Cost about \$45,000 with equipment.

Majestic Iron Works, Inc., New York, has been organized by Daniel Edelberg, 753 Fox Street, Bronx, to manufacture iron and steel products.

Rossville Alcohol & Chemical Corp., New York, is being organized to take over and expand American Solvents & Chemical Corp., 122 East Forty-second Street, and affiliated interests, including Rossville Commercial Alcohol Corp., with plant at Lawrenceburg, Ind. New company will rebuild unit at last noted works, including rectifying division, recently damaged by fire with loss of about \$50,000. Reorganization will also include General Industrial Alcohol Corp., with plants at Marrero, near New Orleans and Lawrenceburg.

Commissioner of Correction, State Office Building, Albany, N. Y., has awarded general contract to Shapiro Brothers, 1560 Broadway, New York, for new storage and distributing building at Sing Sing Prison, Ossining, N. Y. Cost about \$75,000 exclusive of equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until June 28 for 5600 pairs of steel shears (Schedule 8254) for Brooklyn yard.

Power Plant Engineering Co., Inc., Bronx, New York, has been organized by David Lane, 1383 Jerome Avenue, and associates to manufacture oil burners and kindred power equipment.

Department of Hospitals, Municipal Building, New York, plans early call for bids for steel tanks of 12,000 and 8000-gal. capacity, respectively, with steel supports, etc., for institution on Welfare Island.

Department of Sanitation, Municipal Building, New York, has been authorized by Board

of Estimate to arrange for erection of three incinerator plants, each to cost about \$962,000 with power machinery and other equipment. A fourth plant to cost like amount, will be built later.

Bonnell Electric Mfg. Co., Inc., New York, has been organized by William A. Bonnell and Richard J. Schnepf, to take over and expand company of same name at 192 Chambers Street, manufacturer of electrical equipment and supplies.

Niagara Hudson Power Co., Syracuse, N. Y., has secured 75-ft. right of way in northern part of Westchester County for erection of steel tower transmission line, to connect its system with that of New York Edison Co., New York. Work is under way on line from Albany, N. Y., south to point noted, and for power substation to cost over \$1,000,000 with equipment.

Sundh Electric Co., 209 Parkhurst Street, Newark, manufacturer of industrial lighting control equipment, electric furnace control equipment, etc., is now operating on five-day week basis. Shipments during May were 50 per cent in excess of any other month this year.

Pioneer Tool Co., Bloomfield, N. J., recently organized by Elchanan Echikson, 670 Ridge Street, Newark, and associates, has leased part of one-story factory at 40 Orange Street, Bloomfield, for manufacture of cutlery, painters' tools and other hardware products.

National Gasoline & Oil Tank Co., Inc., Passaic, N. J., has been organized by Joseph Russell, 41 Somerset Street, Garfield, N. J., and associates, capital \$550,000, to manufacture steel tanks for oil, gasoline, etc.

General Controls Corp., Central Avenue and Booraem Street, Jersey City, N. J., recently organized to take over a group of seven companies in kindred lines of electric equipment manufacture, has leased four-story building at location noted for production of automatic time switches, electric and gas control equipment, electric clocks, etc. Initial operations will be given over primarily to assembling. Company has also taken option on 50,000 sq. ft. adjoining for future extension, at which time several of existing plants will be removed to this location. Arthur Dorsey is president.

Hattfield Wire & Cable Co., Hillside, Newark, manufacturer of rubber-covered electric wire and cable, and other wire specialties, is running on full time five and one-half day week with regular working quota. Branch plant at

Hackettstown, N. J., is operating on day and night shift with increased working force.

Board of Education, 221 Cross Street, Harrison, N. J., asks bids until July 14 for manual training equipment and supplies. James A. Brophy is secretary.

J. J. Hockenjos Co., 829 Broad Street, Newark, manufacturer of paints, varnishes, etc., has plans for a three-story factory, 60 x 200 ft. Cost over \$65,000 with equipment. Henry D. Scudder, Jr., 9 Clinton Street, is architect.

Southwark Metal Products Co., Philadelphia, has leased floor in building at 470 North Fifth Street for manufacture of wire goods and metal specialties.

American Car & Foundry Motors Co., 30 Church Street, New York, a subsidiary of American Car & Foundry Co., same address, is planning removal of motorbus manufacturing plant from Detroit to works of J. G. Brill Co., Philadelphia, manufacturer of railroad and traction cars. Expansion will be carried out at latter plant, where motorbus production will be concentrated.

Depot Quartermaster, Marine Corps, Philadelphia, asks bids until June 30 for 14,000 flashlight batteries and 10,000 dry batteries (Schedule 18).

Melrath Supply & Gasket Co., Inc., 613 Wood Street, Philadelphia, manufacturer of gaskets and other steam specialties, has purchased three-story building on adjoining site for expansion.

Brinan & Gilbert, Philadelphia, recently organized, has leased space in building at Fifth and Brown Streets for manufacture of sheet metal products.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until June 28 for quantity of tool steel (Schedule 8253) for Philadelphia yard.

Lycoming Mfg. Co., Williamsport, Pa., manufacturer of gasoline engines, parts, etc., a subsidiary of Cord Corp., Auburn, Ind., has increased production for manufacture of straight 8- and 12-cylinder engine units. About 2000 men have been added to working quota.

Northern New York Utilities Co., Public Square, Watertown, N. Y., is planning power substation and distributing system at Diana, N. Y., and vicinity.

American Cyanamid & Chemical Corp., New York, a wholly owned subsidiary of American Cyanamid Co., on July 1 will con-



ECONOMICAL METAL CLEANING

There is only one way to economically clean metals,—that is to use a metal cleaner which is especially fitted to do the job you want done. That is why there is a large family of Wyandotte Metal Cleaners, each made to do a certain kind of metal cleaning superlatively well • Among the group of Wyandotte Metal Cleaners there is one which will save you money,—by turning out better work, with fewer rejects, in quicker time • A letter will bring a Wyandotte Service Man to work out your cleaning problem in your own plant. His services place you under no obligation • Write for detailed information.

THE J. B. FORD COMPANY, WYANDOTTE, MICHIGAN

Wyandotte
Metal Cleaners

solidate activities of following subsidiaries: American Cyanamid Sales Co.; Kalbfleisch Corp.; A. Klipstein & Co., Inc.; Kalbfleisch Bauxite Co., Inc.; Fumigators Supply Co.; Superior Chemical Co., Inc., and John C. Wiarda & Co., Inc. Activities in industrial and heavy chemicals of American Cyanamid Co., which will continue to handle fertilizer materials and mining chemicals, will be merged with those of American Cyanamid & Chemical Corp. Latter organization will also control activities of American Powder Co., Selden Co., Structural Gypsum Corp., Owl Fumigating Corp. and Kalbfleisch Corp. of Surinam, Dutch Guiana.

Cahill Steel Treating Co., Bloomfield, N. J., has recently secured orders for heat treating equipment that require operations 24 hr. a day seven days a week. Company has installed an American Gas Furnace heating machine and a Leeds & Northrup recording pyrometer and automatic control device.

◀ SOUTH ATLANTIC ▶

Coastwise Petroleum Co., Munsey Building, Baltimore, has plans for new bulk oil storage and distributing plant, including battery of 14 steel tanks, pumping station and other equipment. Contract for part of program has been let to Industrial Piping & Engineering Co., Court Square Building.

Board of District Commissioners, District Building, Washington, asks bids until July 8 for quantity of steel lockers for Roosevelt high school.

Norfolk & Western Railway Co., N. & W. Railway Building, Roanoke, Va., asks bids until June 29 for quantity of locomotive steel tires, required from July 1 to September 30 (Serial Contract AA-623).

Purchasing and Contracting Officer, Holabird Quartermaster Depot, Baltimore, asks bids until June 28 for quantity of spare parts for motor trucks (Circular 142).

Construction Service, Veterans' Administration, Washington, asks bids until June 29 for one centrifugal pump (Circular 575-M).

General Purchasing Officer, Panama Canal, Washington, asks bids until July 1 for one motor-driven drill press, six motor-driven valve operators and other equipment (Schedule 2763).

Atlantic Engineering Co., 185 Seventeenth Street, N.E., Atlanta, Ga., plans purchase of a locomotive crane, about 35 to 40-ton capacity.

Baltimore City Hospitals, Office of City Register, City Hall, Baltimore, Joseph M. Shults, assistant superintendent, asks bids until June 29 for one motor-driven air compressor unit.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until June 28 for one motor-driven milling machine and attachments (Schedule 8241) for New York or San Francisco Navy Yard, bar rivet steel (Schedule 8244); until July 5 for hacksaw frames (Schedule 8251), for solder (Schedule 8249), brass, bronze and copper (Schedule 8258) for Eastern and Western yards; four motor-driven sliding head drilling machines (Schedule 8273), eight motor-driven grinders and four buffing and polishing machines (Schedule 8265), five pneumatic hoists (Schedule 8264) for New York or San Francisco yards.

Pan-American Airways, Inc., 122 East Forty-second Street, New York, and Miami, Fla., is considering erection of two additional hangars with repair and reconditioning facilities at Dinner-Key base airport, Miami, with new terminal building. Cost over \$150,000 with equipment.

United States Coast Guard Headquarters, Washington, asks bids until June 30 for parts for eight-stage horizontal Curtis turbine, 2500 hp.

Superintendent of Lighthouses, Fifth District, Baltimore, asks bids until June 28 for watertube boilers for lighthouse tender.

◀ SOUTHWEST ▶

Board of Public Service, City Hall, St. Louis, plans installation of steam power plant with boilers, pumping machinery and other equipment in connection with new municipal hospital group for negroes. Entire project will cost about \$300,000. Albert Osburg is architect and L. R. Bowen, engineer, for board.

Ozark Airways, Inc., 1151 South Ferguson Street, Springfield, Mo., George M. Prescott, president, is planning purchase of about 100 acres on James River Club Road for expansion in airport, to include hangars, shop and other field units.

Board of Education, Leavenworth, Kan., plans manual training department in two-

story high school, for which bids will soon be asked on general contract. Felt & Hazelwood, 419 Delaware Avenue, Leavenworth, are architects; Felt, Dunham & Kriehn, 300 West Forty-seventh Street, Kansas City, Mo., are associate architects.

Common Council, Galva, Kan., plans installation of water tank and tower, pumping machinery and other equipment in connection with extensions and improvements in municipal waterworks. F. E. Denlin, Wichita, Kan., is consulting engineer.

Standard Engineering Works, Inc., St. Louis, has been organized by Emil Doerr, 5015 Muddock Street, and associates, to manufacture mechanical equipment.

State Highway Department, Jefferson City, Mo., let general contract to M. E. Gillioz, Monett, Mo., for one-story and basement equipment storage and distributing plant, 66 x 98 ft., with service and garage facilities for State motor trucks, and two-story unit, 43 x 53 ft., at Hannibal, Mo. Cost about \$60,000 with equipment; also general contract for similar units at St. Joseph, Mo., to H. R. Willems, Marshall, Mo., cost like amount.

St. Louis Armature Service Co., St. Louis, has been organized by John Kern, 4238 College Street, and associates to take over and expand company of same name, with electric equipment repair and construction works at 2905 Washington Street.

Crescent Foundry Co., 1210 South Johnson Street, Amarillo, Tex., plans one-story foundry addition. Cost close to \$20,000 with equipment.

Neches Iron Co., Houston, Tex., has been organized by Cooper K. Ragan and H. Malcolm Lovett, Houston, to manufacture iron and steel products.

City Ready-Cut House Co., Campbell Street, Houston, Tex., manufacturer of standardized house units, plans rebuilding portion of plant recently destroyed by fire.

Crystal Ice Co., Eagle Pass, Tex., has plans for an electric-operated artificial ice-manufacturing plant. Cost over \$85,000 with machinery.

Humble Oil & Refining Co., Houston, Tex., has acquired oil properties of Eagle Oil Co., near Conroe, Tex., totaling 820 acres, and plans development, including installation of drilling machinery, storage facilities, etc.

◀ CENTRAL DISTRICT ▶

Bell Telephone Co. of Pennsylvania, 416 Seventh Avenue, Pittsburgh, plans installation of power station, underground lines and other mechanical equipment in new exchange at Bellefonte, Pa. Cost over \$100,000 with equipment. John T. Windrim, Commonwealth Building, Philadelphia, is architect.

Mellotone Muffler Co., Pittsburgh, has been organized by Greer McIlvain and J. U. Anderson, Fulton Building, to manufacture exhaust systems, mufflers, etc., for internal combustion engines.

Dravo Contracting Co., Neville Island, Pittsburgh, has advanced production in fabricating works. Company has secured order from Apex Oil Corp., Nashville, Tenn., for two tank barges, each 130 ft. long, 30 ft. wide and 8.6 ft. deep; also contract from Atlantic Gulf & Pacific Co., New York, for derrick scow, 60 ft. long, 30 ft. wide and 6 ft. deep.

Brier Hill Coal Co., Butler, Pa., plans installation of crushing and screening equipment, continuous conveyor feeder about 400 ft. long, elevating equipment, vibrators and auxiliary equipment in connection with re-building mine tipple recently destroyed by fire. Charles H. Gould is general manager.

Pennsylvania Rubber Co., Jeannette, Pa., manufacturer of automobile tires, etc., has advanced production schedule at mill. Sales are showing increase of over 25 per cent as compared with same time last year.

Department of Water, Youngstown, Ohio, W. D. Cregan, commissioner, plans installation of standpipe, pumping machinery and other equipment in connection with waterworks expansion and improvements. Fund of \$400,000 is proposed for work.

Willys-Overland Co., Wolcott Boulevard, Toledo, Ohio, is increasing production at automobile manufacturing plant and number of departments have been placed on five-day week basis. Employment is now being given to about 4000 men.

Automotive Steam Engine Corp., Cleveland, care of Thompson, Hine & Flor, Guardian Building, has been organized by J. F. Strough and C. R. Riggs, capital \$100,000, to manufacture engines and parts.

Daney Aluminum & Bronze Castings Co., Toledo, Ohio, recently organized by Frank J. Daney, Toledo, and associates, has leased local

property for new plant and will begin production at once. Mr. Daney was formerly superintendent at France Foundry & Machine Co., 1215 West Bancroft Street.

Goodyear Tire & Rubber Co., Akron, Ohio, has adopted increased production schedule, running on four 6-hr. day shifts, seven days a week.

East Shore Machine Products Co., 831 East 140th Street, Cleveland, has asked bids on general contract for one story shop addition, 28 x 70 ft. Andrews-Preston Co., 308 Euclid Avenue, is architect.

Utilities Department, City Hall, Cleveland, has awarded contract to Hunkin-Conkey Construction Co., 1740 East Twelfth Street, for new buildings at Westerly sewage treatment works, including blower department, waste destructor, sludge digester tank unit, detritor building and other structures. Cost over \$175,000 with machinery.

Department of Public Service, City Hall, Columbus, Ohio, W. P. Halenkamp, director, has plans for new refuse incinerator, including power destructor, conveying, loading and other equipment. Cost over \$65,000 with machinery.

City Council, Columbiana, Ohio, is considering erection of new municipal electric light and power plant. Cost about \$100,000 with equipment.

India Tire & Rubber Co., Mogadore, Ohio, has increased production and is now running on 6-hr. shifts, seven-day week basis with regular working quota.

Guide Lamp Corp., 1637 West Twenty-fifth Street, Anderson, Ind., a unit of General Motors Corp., has plans for one-story addition, 50 x 100 ft. Cost over \$35,000 with equipment.

Auburn Automobile Co., Auburn, Ind., has resumed full time 6-day week production schedule, with number of departments employing night shifts. Central Mfg. Co., Connersville, Ind., manufacturer of automobile bodies, an affiliated interest, also has resumed on similar basis after period of curtailment. Both plants have reinstated about 1400 men. Limousine Body Co., Kalamazoo, Mich., another subsidiary, manufacturer of convertible automobile bodies, also will increase production.

Cummins Engine Co., Columbus, Ind., manufacturer of automobile engines, will soon let general contract for one-story and basement addition, 190 x 200 ft. Cost over \$100,000 with machinery. Foster Engineering Service Co., Indiana Pythian Building, Indianapolis, is architect and engineer.

Packard-Capehart, Inc., Fort Wayne, Ind., has been organized by H. E. and I. V. Capehart, Fort Wayne, to manufacture talking machines and parts.

United States Radio & Television Corp., Marion, Ind., is increasing operations for manufacture of new radio models and electric refrigerators. Many employees are being reinstated and working quota of about 500 persons will be arranged at once.

Mid-Continent Petroleum Corp., North Thirteenth Street, Terre Haute, Ind., has awarded general contract to Albert W. Schnuck, 310 Scott Street, Vincennes, Ind., for bulk oil storage and distributing plant, 80 x 125 ft., at Vincennes.

City Council, Jackson, Mich., will ask bids soon for pumping machinery and other power equipment for new sewage disposal works. Cost over \$500,000 with machinery. William Cruise is city engineer. Fargo Engineering Co., Jackson, is consulting engineer.

Pure Oil Co., 35 East Wacker Drive, Chicago, has let general contract to Trans-American Construction Co., Midland, Mich., for new oil refinery and storage and distributing works at Midland. Cost over \$400,000 with equipment.

Wagner Products Co., Detroit, has been organized by H. W. Wagner and associates to take over and expand company of same name at 4025 Maple Street, Dearborn district, manufacturer of automobile equipment and accessories.

New Haven Foundry Co., New Haven, Mich., has adopted full time day and night production schedule. Large part of output is cylinder heads and kindred castings for Chrysler Corp., Detroit. Company has recently made improvements in foundry, including installation of new equipment.

Fuel Oil Corp., Woodland Avenue and Grand Trunk Railroad, Detroit, is considering new bulk oil storage and distributing plant. Cost over \$85,000 with tanks and equipment.

Sterling Cable Corp., 3524 Twenty-fourth Street, Port Huron, Mich., recently organized by officials of Electric Auto-Lite Co., Toledo, Ohio, as a subsidiary, will occupy part of Port Huron plant of American Enameled Magnet

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Wire Co., another subsidiary of parent company, for manufacture of a new line of rubber-covered cables and wire.

◀ SOUTH CENTRAL ▶

Daniel Shea Boiler Works, 1106-S Kansas Street, Memphis, Tenn., has taken out permit for one-story plant, 100 x 200 ft., to replace works recently damaged by fire. Cost over \$25,000 with equipment.

Parker Packing Co., Natchez, Miss., plans rebuilding part of meat-packing plant recently destroyed by fire. Loss over \$60,000 with equipment.

Memphis Bonded Warehouse Co., Inc., 20 Adams Avenue, Memphis, Tenn., Ellis B. Anderson, president, contemplates new river and rail terminal on Wolf River, including three-story and one-story buildings with mechanical-handling equipment, oil storage and distributing tanks, and grain elevator of about 1,000,000 bu. capacity. Terminal will be equipped with unloading machinery, electric trucks and kindred equipment. Cost close to \$1,000,000 with equipment.

Louisville & Nashville Railroad Co., Louisville, has awarded contract to Fairbanks, Morse & Co., 300 South Wabash Avenue, Chicago, for direct-type locomotive coaling plant at Nashville, Tenn., with elevating capacity of 90 tons an hr.

◀ NEW ENGLAND ▶

Carr Mfg. Corp., Bristol, R. I., recently organized to manufacture rubber products, has let general contract through Bristol Mutual Realty Corp., Bristol, to Peter Martelly & Son, Bristol, for one-story plant, 66 x 304 ft., with wing extension, 21 x 334 ft. Cost over \$75,000 with equipment. Edward W. Boyle, 178 Oak Hill Avenue, Pawtucket, R. I., heads company.

Landers, Frary & Clark, New Britain, Conn., manufacturer of electric heating and cooking equipment, is planning manufacture of electric refrigerators and will arrange plant facilities for that purpose.

Liquid-Air Container Corp., Boston, has been organized by George M. Webster, 250 Stuart Street, and associates, capital \$100,000, to manufacture tanks and kindred products.

Remington Arms-Union Metallic Cartridge Co., Hartford, Conn., has adopted overtime production schedule in sporting arms and shot-shell departments, with increased working quota.

Commanding Officer, Springfield Armory, Springfield, Mass., asks bids until June 27 for quantity of chain-link wire fence with six gates (Circular 56).

Phillips-Baker Rubber Co., Westfield Street, Providence, R. I., manufacturer of rubber products, has awarded general contract to Central Engineering & Construction Co., Pawtucket, R. I., for two-story addition, 41 x 115 ft. Cost over \$35,000 with equipment.

Moore Drop Forging Co., Walter Street, Springfield, Mass., is increasing production and has added about 200 workers to force. Company has large contract for drop forgings for Ford Motor Co.

Associated Oil Burner Co., Inc., Hartford, Conn., has been organized by Albert Karotkin and Samuel Kinsler, Hartford, to manufacture oil burners and oil-burning equipment.

◀ MIDDLE WEST ▶

Modern Air Cooling Co., 111 West Washington Street, Chicago, has been organized by Archie S. Feinberg and associates, to manufacture air-conditioning equipment and devices.

City Council, Rochester, Minn., is arranging special election in July to arrange fund for installation of a municipal natural gas distributing system. Service will be furnished by Minnesota-Northern Natural Gas Co., Minneapolis.

Construction Machinery Co., Waterloo, Iowa, manufacturer of cement and concrete mixers, hoists, pumps, etc., has been acquired by Philip L. Bryant, head of Bryant Paving Co., Waterloo. Company will be reorganized with Mr. Bryant as president and L. F. Holden, secretary and treasurer. Plant will be operated on increased production schedule. New organization has acquired building at Philadelphia for Eastern factory branch, storage and distributing plant.

City Council, St. Edward's, Neb., plans call for new bids for municipal electric light and

power plant. Cost about \$60,000 with equipment.

Double Duty Oil Burner Co., 317 Eighteenth Street, Rock Island, Ill., has been organized by R. W. Schode and C. L. Esbjorn, Rock Island, to manufacture oil burners and oil-burning equipment.

Board of Water Commissioners, city and county of Denver, 1509 Cleveland Place, has plans for one-story pumping plant 40 x 105 ft. Cost about \$50,000 with pumping machinery and auxiliary equipment. R. E. Stiffler, 816 Twelfth Street, is architect.

Three Forks Portland Cement Co., Ideal Building, Denver, an interest of Ideal Cement Co., same address, is arranging for resumption of mill operations at Trident, Mont., following curtailment of several weeks. Company will make improvements in plant, including equipment betterments.

Metropolitan Utilities District, Omaha, Neb., C. D. Robinson, chief engineer, will make improvements in artificial gas plant, including installation of feedwater heater, water softener and accessory equipment. Expansion and improvements have also been authorized at filter plant, with installation of equipment. Cost about \$50,000.

Common Council, Milford, Iowa, has called special election on July 12 to vote authorization of erection of new municipal electric light and power plant.

Board of Education, Mount Pleasant, Iowa, plans manual training department in new high school unit to replace Seeley memorial high school, recently destroyed by fire. Cost about \$150,000. Keffer & Jones, Masonic Temple, Des Moines, Iowa, are architects.

Public Utilities Board, Rochester, Minn., A. J. Lentfer, secretary, asks bids until June 28 for pumping machinery, feedwater heater, piping and supporting steel structure, etc.

Westinghouse Electric Elevator Co., 1500 North Branch, Chicago, will build one-story addition to assembly room and machine shop. Cost, \$60,000. A. L. Jackson Co., 310 South Michigan Avenue, Chicago, is general contractor.

Dahlberg Power & Light Co., Solon Springs, Wis., is awaiting approval by Wisconsin Public Service Commission for proposed new dam and hydroelectric generating station on Eau Claire River, to cost about \$50,000.

Hartland, Wis., has approved \$45,000 bond issue for initial construction of municipal waterworks and sewage disposal system to cost \$110,000, remainder to be raised by special assessments as required. W. W. Parker is village clerk.

Portage, Wis., has plans by Pearse, Greeley & Hansen, consulting engineers, 6 North Michigan Avenue, Chicago, for sewage disposal plant and system to cost \$50,000. H. V. Tennant is city engineer.

City of Milwaukee, waterworks department, will ask bids shortly on initial construction of \$450,000 improvement program covering three years and consisting of two 6,000,000-gal. steel storage tanks costing \$100,000 each, electrically operated pumping station costing \$150,000, and feeder main costing \$100,000. One tank and feeder main will be built this year, pumping station in 1933 and second tank in 1935 or 1936. Joseph Schwada is city engineer.

◀ PACIFIC COAST ▶

Bureau of Yards and Docks, Navy Department, Washington, asks bids until July 6 for five new buildings at Naval Air Station, Sunnyvale, Cal., (Specification 6874).

City Council, Oceanside, Cal., is considering installation of a municipal electric light and power plant, using Diesel engine-generator units. Estimates of cost are being made.

Drill Pine & Casing Cutter Co., Los Angeles, care of William P. Mealey, Great Republic Life Building, has been organized by Ray Andrada, Compton, Cal., and R. A. Brown, Los Angeles, to manufacture oil well equipment.

State Highway Commission, Salem, Ore., has asked bids on general contract for one story equipment storage and distributing plant with maintenance and repair departments at Klamath Falls, Ore. R. H. Baldock is State highway engineer.

City Council, Vernon, Cal., has awarded general contract to Mitty Brothers Construction Co., 5531 Downey Road, for new municipal power plant, 170 x 240 ft., 50 ft. high, at \$209,525.

Board of Directors, Upland Sanitarium Corp., Upland, Cal., care of Edward C. and Ellis W. Taylor, 803 West Third Street, Los Angeles, architects, plans steam power plant,

steel water tanks, water-softening and filtration machinery, incinerator plant and other mechanical units at new institution on 10-acre tract at Alta Loma, Cal. Cost about \$300,000.

Shell Oil Co. of British Columbia, Ltd., Vancouver, B. C., affiliated with Shell Oil Co., 200 Bush Street, San Francisco, has plans by W. N. Thompson, chief engineer for last noted company, for new refinery near Vancouver. Project will include 400-ft. deep sea dock for tanker service. Cost about \$1,000,000 with equipment. C. E. Frisholz, Vancouver, is construction engineer.

Board of Public Works, Seattle, let general contract to Bayley Hipkins, Inc., Eitel Building, for erection of Diablo municipal hydroelectric generating plant on Skagit River, at \$1,747,705. Entire development will cost over \$4,000,000 with steel tower transmission lines, switching stations, main and auxiliary power equipment.

Valley Fishing Tool Co., Inc., Los Angeles, care of Roy Maggart, Van Nuys Building, has been organized by Allen Miller and Alfred J. Luke, Los Angeles, to manufacture oil well drilling equipment.

◀ FOREIGN ▶

Monel-Weir, Ltd., Glasgow, Scotland, manufacturer of monel metal, is planning establishment of new works near Birmingham, England, and will remove equipment from Glasgow plant to that location, where expansion will be carried out. It is a subsidiary of G. & J. Weir, Ltd., Cathcart, Glasgow, manufacturer of air compressors, parts, etc.

Deutsche Tecalemit, G.m.b.H., Bielefeld, Germany, has been organized by interests operating Metallwerk Windelsbleiche, G.m.b.H., Windelsbleiche, near Bielefeld, to establish plant for manufacture of automobile lubricating devices and equipment. Company is capitalized at 250,000 m. Tecalemit, S.A., Paris, France, is interested in new company and will hold about one-half of capital.

Ford Motor Co., Ltd., London, England, has arranged with Ford Motor Co. of Canada, Ltd., Windsor, Ont., for production of 18,000 to 20,000 new Ford V-eight engines, totaling about \$3,000,000, and production schedule will be stepped-up at once at Canadian plant. Order calls for shipment of about 1500 engines a month for use in Ford automobiles manufactured in England.

Trade Notes

Western Pipe & Steel Co. of Illinois, Blue Island, Ill., subsidiary of Western Pipe & Steel Co. of California, has changed its corporate name to Wepsco Steel Products Co.

The Continental Steel Corp., Kokomo, Ind., has moved its Waco, Tex., office to 4905 Swiss Avenue, Dallas. R. T. Williams is in charge.

Case Hardening Service Co., 2281 Scranton Road, Cleveland, has been appointed by Ray Burner Co., San Francisco, as sales representative for Ray oil burners in the Cleveland district.

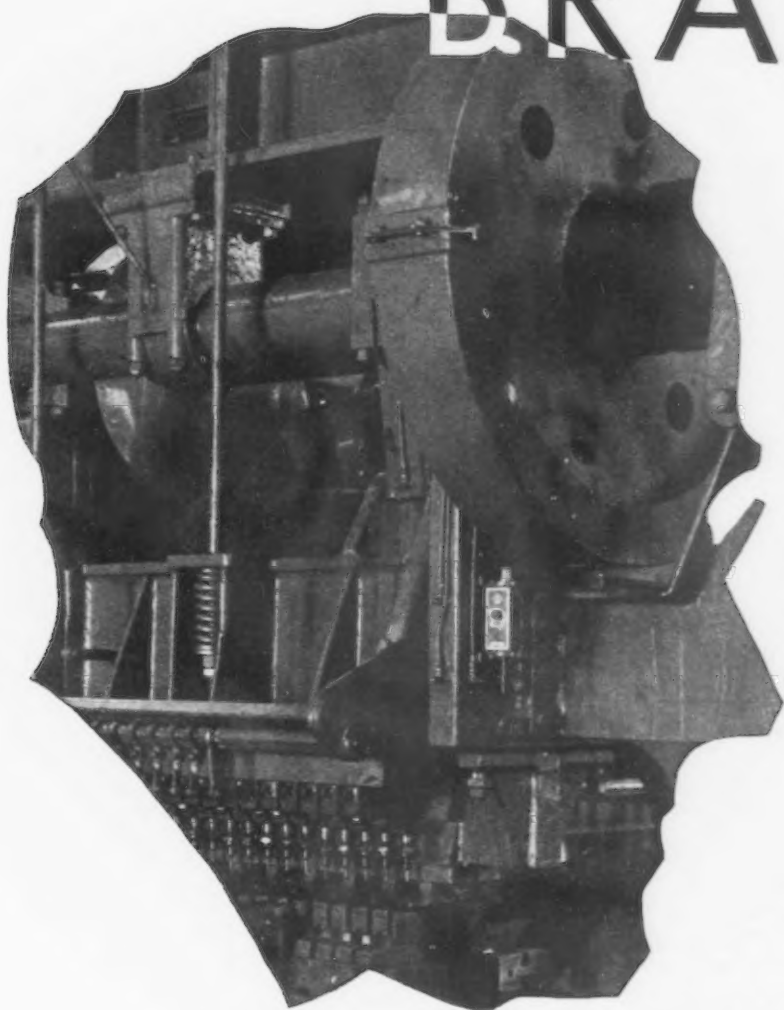
Foster Wheeler Corp., New York, has appointed Consolidated Steel Corp., Ltd., Los Angeles, as its exclusive sales and manufacturing representative in the Pacific Coast territory, including California, Washington, Oregon, Nevada, Utah, Arizona and New Mexico. In addition to handling sales, Consolidated Steel Corp. will manufacture the major part of Foster Wheeler equipment installed in the Pacific Coast territory. Foster Wheeler Corp. will continue to maintain an engineering organization in the Petroleum Securities Building, Los Angeles, in charge of W. L. Rifenberick.

Ross Heater & Mfg. Co., Inc., Buffalo, has appointed as its representatives G. G. Van Tuyl, Rochester, for western New York; Arno N. Dietze, Security Building, Milwaukee, for the Milwaukee territory, and Gustavo Preston Co., Boston, for the Boston district.

Detroit Seamless Steel Tubes Co., West Warren and Wyoming Avenues, Detroit, has added the following concerns to its list of mill supply distributors for its Detroited bushing stock: Topping Brothers, New York; Lewis E. Tracy Co., Boston; Charles C. Lewis Co., Springfield, Mass., and E. C. Church Co., Providence, R. I.

Kingsbury Machine Tool Corp., Keene, N. H., has appointed Stedfast & Roulston, Inc., Boston, as its exclusive representative in the sale of its drilling and tapping equipment in New England, excepting Connecticut.

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What Will Industry Do With the Technical Graduate?

(Concluded from page 1348)

from the standpoint of ability and of flexibility."

Another company writes, "We still have several men who have not completed their training course, but we do not expect to take on new men this year unless the situation takes a definite turn for the better during the summer."

Graduate Courses in Industry

The value of having a steady stream of technical graduates entering the ranks of a manufacturing company is apparent in all of the replies. One company writes that its apprenticeship course was one of the last features which it relinquished in the struggle to keep above water by cutting its expenses to the limit. As a way out of the present situation many different suggestions were offered. A closer cooperation between industry and technical schools might result in a sharing of the burden of looking after students beyond graduation. This might take the form of a post-graduate course in which the student spends most of his time at the plant of the manufacturer with little or no pay but with the plant facilities thrown open for his education.

The college graduate not only faces the problem of earning a livelihood but also the problem of constructive employment of his time after graduation. Technical school instructors tell of the significance of this latter feature. The young man who has finished his school training and is anxious to enter industry receives a blow the seriousness of which is difficult to exaggerate when he finds there is no place for him in the industrial world even at no salary. A manufacturer cannot take on a new man regardless of pay when there are a dozen former employees recently relinquished who would be willing to reenter on the same condition prescribed for the student.

One who comments on this general situation suggests that all technical schools urge this year's graduates to take an extra year of post-graduate work at their own schools. There is nothing particularly wrong with this plan even under normal business conditions.

Might Help Technical Research

Such a plan has been practiced in Germany for many years independent of the economic situation and yet Germany has managed to keep in the fore rank in most technical fields. Perhaps it is because of this very emphasis on academic training that Ger-

many has been able to hold to such a high industrial level in the face of obstacles. At any rate the suggested extra year for this year's American graduates would give constructive occupation to students whose morale demands it at this time, and, in addition, it is possible that it would help some of the students to a better understanding of industry's needs and the growing importance of technical research.

Trackwork Shipments Lower in May

Shipments of trackwork for T-rail track of 60 lb. and heavier in May amounted to 3061 net tons, compared with April shipments of 3340 tons, which is the largest monthly total thus far in 1932, according to report of the American Iron and Steel Institute. Similar shipments in May, 1931, totaled 7453 tons. Shipments in the first five months of 1932 aggregated 15,331 tons, as compared with 35,160 tons in the corresponding period of last year.

Foundrymen Discuss Malleable Iron

Contrasting examples of good and bad design of brass and bronze castings were presented in a paper entitled "Influence of Design on Brass and Bronze Castings," prepared by L. H. Fawcett of the Naval Gun Factory, Washington. Of particular interest were the practical "case" illustrations of means of securing uniform metal sections and intersections in ribs, flanges, bosses, etc., to secure sound castings.

The relation of the freezing range of the metal poured to the distribution of shrinkage cavities was brought out by N. B. Pilling, co-author with T. E. Kihlgren, both of International Nickel Co., of a paper entitled "A Method for Study of Shrinkage and Its Distribution in Castings." Internal voids are most likely to occur where the freezing range of the metal is narrow and external distortions where it is wide. The study covered the shrinkage behavior of a number of non-ferrous metals and alloys, as tested by a standardized method of bottom gating. The "Casting Properties of Nickel Bronzes," a paper also prepared by the same co-authors,

was presented at another session and contained valuable and original material.

The action of phosphorus as a deoxidizer in red brass was described by R. W. Parsons, metallurgist, the Ohio Brass Co., Mansfield, Ohio. The author shows that, in addition to acting as a deoxidizer, phosphorus in red brass helps fluidity and protects the molten stream during pouring.

In addition to the technical papers, the non-ferrous shop operation courses proved of the usual value and interest.

Iron Shoe Rails in Good Condition After 90 Years

Mine tracks laid in 1840—the remains of one of the oldest underground railroad systems in the United States—were recently found in the Thomaston section of Pine Knot Colliery, part of the properties of the Philadelphia & Reading Coal & Iron Co. In spite of 90 years of exposure to the ravages of time and to the severe action of the mine's sulphur water, the puddled iron shoe rails of the old tracks were in excellent condition.

Sections of these rails, sent to the laboratories of the Reading Iron Co. for analysis, showed that the puddled iron of which they are made is closely similar to the puddled iron being made today in the Reading company's plants in the Schuylkill Valley.

The gage of the tracks laid in 1840 was 44 in., the same gage as is used today at Pine Knot Colliery. The shoe rails were ½ in. thick and 2 in. wide, and were mounted on heavy, squared hand-hewn timbers. The timbers, in turn, were set on cross ties. Small nails were used to fasten the iron shoe to the timbers and large spikes to fasten the wooden track to the cross ties.

Shipments of iron ore from the port of Duluth-Superior in the 10-year period 1921 to 1930, inclusive, averaged more than 33,500,000 tons, while the average incoming shipments of coal were more than 10,500,000 tons, according to Chairman T. V. O'Connor of the Shipping Board in announcing the publication of a new volume in the series devoted to ports of the Great Lakes.

A new cast metal known as Arzon metal has been developed by the Arcade Malleable Iron Co., Worcester, Mass. Claims for this new metal include ultimate strength from 80,000 to 100,000 lb. per sq. in., elongation 5 per cent to 15 per cent in 2 in. and elastic limit 50,000 to 60,000 lb. per sq. in.